SYMPTOMS OF MATERNAL DEPRESSION: RESULTS FROM THE ALASKA PRAMS 2012-2014 AND ITS THREE-YEAR FOLLOW-UP SURVEY, CUBS 2015-2017, AND IMPLICATIONS FOR POLICY DESIGN

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SYMPTOMS OF MATERNAL DEPRESSION: RESULTS FROM THE ALASKA PRAMS 2012-2014 AND ITS THREE-YEAR FOLLOW-UP SURVEY, CUBS 2015-2017, AND IMPLICATIONS FOR POLICY DESIGN

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For Stephen, Simon, Audrey, and Clara Vindigni

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SUMMARY

This dissertation is an in-depth analysis of the prevalence and risk factors of maternal depression in Alaska. I study a cohort of women who gave birth in Alaska between 2012 and 2014, using statewide population-based survey data collected shortly after birth and three years after birth. Multiple regression analyses confirm previous studies' findings that history of depression, stressful life events, and lack of social support are strong risk factors for symptoms of maternal depression (SMD). In addition, after controlling for sociodemographic, perinatal health, and psychosocial variables, first-time mothers had greater odds of reporting SMD. Age was also a significant predictor of SMD. In contrast to the U-shaped relationship between age and maternal depression shown in other studies, I observe an inverted U-shaped curve: the odds of reporting SMD are lowest for women 19 and under, increases for those 20–34, and decreases slightly for women age 35 and older. Surprisingly, teenage moms 19 years and under had the lowest odds of reporting SMD. Asian/Pacific Islander women have significantly higher odds of reporting SMD, including persistent and possibly overlooked and untreated depression three years after giving birth.

Findings from this study can be used to design policy and create systems change to improve the health and well-being of mothers and families. Any strategy addressing maternal depression would require a two-pronged screening approach: (1) screening to identify women at risk of developing depression, and (2) screening for maternal depression symptoms. Further, expanding Medicaid coverage for mothers from 60 days postpartum to at least 1 year postpartum, preferably 2 years, is one strategy that may help increase opportunities for healthcare providers to treat women with maternal depression.

CHAPTER 1: INTRODUCTION

1.1 Overview

This dissertation is an in-depth analysis of the prevalence and risk factors of maternal depression in Alaska. I study a cohort of women who gave birth in Alaska between 2012 and 2014, using statewide population-based survey data collected shortly after birth and three years after birth. The survey data is from two sources: the 2012-2014 Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) and its three-year follow-up, the 2015-2017 Childhood Understanding Behaviors Survey (CUBS). I first provide an overview of the problem of maternal depression and the policy theory used in this research.

Chapter 2 provides a literature review of prevalence estimates, the risk factors for poor maternal mental health; prevention, detection, and treatment of maternal depression; and the effects of poor maternal mental health on mother-infant relationship and child growth and development. In addition, I present the conceptual framework underpinning this research. Chapter 3 describes the quantitative and qualitative methods and data used for analyses. In Chapter 4, I present the results of the data analysis and provide specific guidance for developing policy tools to improve maternal mental health in Alaska. Chapter 5, the Discussion, provides a summary of the main research findings and interpretations of what the results mean. I discuss policy implications, including a set of concrete actions policymakers can take to improve the health and well-being of mothers and children. Finally, in Chapter 6, I discuss opportunities for future research and the contributions of this study.

1.2 Statement of the Problem

Poor maternal mental health is an important public health and public policy issue because its short- and long-term harmful effects on the well-being of mothers and families can negatively impact society. In addition, mental illnesses are often associated with other chronic diseases and their resulting morbidity and mortality. Maternal mental health disorders, such as depression, anxiety disorders, bipolar disorder, and postpartum psychosis, which can occur during pregnancy or up to a year postpartum, affect up to 1 in 5 women (Gavin et al., 2005), and estimates are as high as 1 in 2 for women living in poverty (Chung, McCollum, Elo, Lee, & Culhane, 2004; Dolbier et al., 2013). Maternal mental disorders often go undiagnosed and untreated, negatively affecting a mother's executive functioning, marital and personal relationships, maternal-infant interaction quality, and children's social and cognitive development (Letourneau et al., 2012). While the topic of postpartum depression is a growing area of research, the focus has typically been on mothers in the in the first few months after giving birth. Symptoms of postpartum depression often do occur in the first four weeks after birth, but many mothers have symptoms and go undiagnosed for up to a year or longer postpartum (Horowitz & Goodman, 2004). Depression is a chronic issue that can have long-lasting, detrimental effects if untreated. There is very little research about maternal depression beyond the one-year postpartum period.

Further, maternal depression leads to increased costs of medical care, inappropriate medical care, child abuse and neglect, increased use of public sector services, and family dysfunction (Earls, 2010; Luca, Garlow, Staatz, Margiotta, & Zivin, 2019). Efforts to detect and treat maternal mental health disorders will improve health

outcomes for mothers and their children, as well as improve women's productivity. This proactive approach of addressing the mental health of mothers, specifically maternal depression, will help decrease the need and use of social services and subsequent costs to the government. Maternal depression is also an important factor in the intergenerational transmission of poverty (Turney, 2011). Addressing this issue can not only help improve mental health, but it can help increase economic opportunities and reduce poverty.

Given the importance of maternal mental health well-being and the healthy development of children, interventions and policies to prevent and treat maternal depression—during pregnancy, postpartum, and beyond—are critical to improving maternal and child health. The negative health outcomes, larger societal effects, and potential costs of untreated maternal depression underscore the need for more evidence-based programs and policies. Maternal mental health has historically been overlooked but has recently gained more attention. State and national legislation, including portions of the Patient Protection and Affordable Care Act (ACA) of 2010, have aimed to improve detection of and treatment of maternal mental health disorders, including maternal depression.

In Alaska, more than 80 percent of communities are accessible only by boat or plane. What makes life challenging for many Alaskans is not Alaska's extreme geography and topographical features, but essential infrastructure and access to services, including health care. Geographic isolation and lack of access to services may contribute to higher rates of depression among those in Alaska. One hospital provider organization estimates that 30 percent of Alaska moms suffer from depression and anxiety during pregnancy and up to a year after childbirth (Providence Health & Services Alaska, 2019).

In addition, racial and ethnic minority women, such as Alaska Native women, have higher prevalence of maternal depressive symptoms than non-Hispanic White women. While there is a lot of research examining maternal depression, less is known about Alaskans and Alaska Native people specifically. A better understanding of differences across population groups would help clinicians and policymakers target screening and treatment policies.

Currently in 2020, at least 16 states have enacted legislation related to maternal mental health, but Alaska has not. Research on the local prevalence of and risk factors for maternal depression and an understanding of what types of initiatives other states are implementing may help Alaska policymakers formulate data-driven policies to promote the well-being of mothers, children, and families.

1.3 Research Questions and Hypotheses

The primary purpose of this research is to estimate the scope of maternal depression in Alaska and better understand how and in what contexts policies and programs can be designed to reduce the prevalence of maternal depression. I determine prevalence of maternal depression in Alaska and examine the association between sociodemographic, perinatal health, and psychosocial factors and maternal depression. I also describe current policies and practices implemented across the United States to address maternal depression. Finally, to promote the use of data for decision making, I apply what I have learned about the scope and nature of maternal depression and the types of strategies used to address it to discuss implications for public policies. The three questions guiding this research are:

1. What is the prevalence of symptoms of maternal depression among women in Alaska who delivered between 2012 and 2014?

a. How many women reporting postpartum symptoms of maternal depression continue to report persistent symptoms at three years postpartum?

2. What sociodemographic, perinatal health, and psychosocial factors are associated with symptoms of maternal depression among women in Alaska?

3. What policy and systems changes are needed to connect women to mental health services and supports in Alaska?

Table 1 below presents my hypotheses related to research question #2.

Table 1. Research question #2 and testable hypotheses

Research Question #2: What sociodemographic, perinatal health, and psychosocial factors are associated with symptoms of maternal depression among women in Alaska?		
Sociodemographic		
	Variable	**Hypothesis**
H1	Race/ethnicity	Alaskan Native, Asian/PI, and Hispanic mothers are more likely to report SMD when compared to non-Hispanic White mothers. After controlling for other sociodemographic, perinatal health, and psychosocial characteristics, the relationship between race/ethnicity and SMD will diminish.
H2	Age	With less financial resources, social support, and life skills to cope with the added stressors of motherhood, younger mothers will have higher risk of SMD. After controlling for other sociodemographic, perinatal, and psychosocial characteristics, the relationship between age and SMD will diminish.
H3	Education	Women with less education are more likely to report SMD. After controlling for other sociodemographic characteristics, the relationship between education and SMD will diminish.
H4	Income	Women with low household incomes are more likely to report SMD, even after controlling for other sociodemographic, perinatal, and psychosocial variables.
H5	Medicaid	After controlling for all other factors, women with Medicaid are less likely to report SMD. As a policy intervention intended to address the financial and health need of low-income families, Medicaid will be a protective factor,
H6	WIC	After controlling for all other factors, women with WIC are less likely to report SMD. As a policy intervention intended to address the financial and health need of low-income families, WIC will be a protective factor.
H7	Marital status	Unmarried women are more likely to report SMD. Single mothers generally have less support with raising a child, which may exacerbate symptoms of depression.
H8	Rural/urban	Controlling for sociodemographic factors, mothers in rural areas are more likely to report SMD due to lack of access to care and less social support.

Table 1. Research question #2 and testable hypotheses (continued)

Perinatal Health		
H9	History of previous depression	Women who have a history of depression before pregnancy are more likely to report SMD. I hypothesize that this is one of the strongest predictors of SMD after controlling for all other factors.
H10	Timing of First Prenatal Care Visit	Women who do not receive prenatal care until later in their pregnancy are more likely to report SMD.
H11	Parity	First-time mothers are more likely to report SMD, even after controlling for sociodemographic factors.
H12	Alcohol use during pregnancy	After controlling for psychosocial factors, alcohol use during pregnancy is not associated with SMD.
H13	Tobacco use during pregnancy	After controlling for psychosocial factors, smoking during pregnancy is not associated with SMD.
H14	NICU Admission	After controlling for all other factors, mothers with a baby admitted to the NICU will be more likely to report SMD.
H15	Home Visitor Services	After controlling for all other factors, women who receive home visiting services will be less likely to report SMD. As a policy intervention intended to address the social, emotional, and health need of low-income families, home visiting services will be a protective factor,
H16	Breastfeeding (ever)	Women who have ever breastfed are less likely to report SMD.
Psychosocial		
H17	Pregnancy intention	After controlling for all other factors, women who had unintended pregnancies are more likely to report SMD.
H18	Stressful life events	Stressful life events is a risk factor for maternal depression. Women with a higher number of stressful life events will be more likely to report SMD, even after controlling for all other factors.
H19	Physical abuse	After controlling for all other factors, women experiencing physical abuse are more likely to report SMD.
H20	Controlling partner	After controlling for all other factors, women with a controlling partner are more likely to report SMD.
H21	Social support	Social support is a protective factor. Women with social support are less likely to report SMD, even after controlling for all other factors.

This study will provide a snapshot of maternal depression for policy and program planning, analysis, and evaluation in the state of Alaska. I summarize Alaska's strengths and gaps in maternal mental health, identify strategies for improvement and areas for further research, and provide recommendations for developing data-driven policies. Findings from this study have the potential to inform state and national maternal mental

health efforts related to screening, clinical service delivery, and public health infrastructure. Though Alaska is not considered a particularly innovative state quick to adopt new policies, there will likely be windows of opportunity for policy entrepreneurs to highlight this problem, set the agenda, and offer policy solutions (Kingdon, 2003). My goal is to have the data and policy tools available for informing policymaking. I hope to also increase the general dialogue and programming efforts around mental health, and by doing so, and help improve outcomes for mothers, children, and families affected by mental illnesses.

1.4 Policy Design Theory

Policy design includes the process of formulating policy alternatives, the content of the policy, and the policy instrument and its implementation. Policy design can be considered as both a verb, the act of creating a policy, and a noun, the actual product or instrument (May, 2003). The concept of policy design began to gain attention in the 1980s, when a group of scholars became interested in formulating public policies in a more systematic manner (Peters, 2014). Beginning with John Dryzek (1983) and then followed by Linder & Peters (1984; 1991) , policy scholars considered what elements would be necessary for an effective design to address complex problems.

Here, I adopt the perspective of policy analysis and design as a distinctive approach to a public health and social problem, as advised by Linder & Peters (1984), who provide a theoretical approach to policy-making through the concept of policy design. Though it was introduced more than three decades ago, this approach is still relevant today. Linder & Peters' theory of policy analysis and design emphasize that design is important in understanding policy outcomes—that is, whether a policy achieves

its intended goal and is effective:

> *A design orientation to analysis can illuminate the variety of means implicit in policy alternatives, questioning the choice of instruments and their aptness in particular contexts. The central role it assigns means in policy performance may also be a normative vantage point for appraising design implications of other analytical approaches. More important, such an orientation can be a counterweight to the design biases implicit in other approaches and potentially redefine the fashioning of policy proposals* (Linder & Peters, 1984)

In the context of public policy to address an issue like poor maternal mental health, design involves both a systematic process for characterizing the problem and identifying the ideal policy instruments. Examining problems from a design perspective offers a prospective, forward-looking way of organizing our thinking and analytical efforts. Once the set of basic instruments, tools, interventions, or policies is developed, we can examine the details of each alternative. Assessing the design of tools will not only increase the effectiveness of the tool chosen for implementation, but it will hopefully also spur consideration of innovative strategies (Linder & Peters, 1984). Linder & Peters suggest that "the idea of design is to link together values, models of causation, and the choice of instrumentation so that better choices can be made" (Linder & Peters, 1984).

In order to formulate policy, MacRae and Wilde (1979) assert that the process requires a definition of the problem, models and alternatives, criteria for the evaluation of alternatives, and an assessment of political feasibility. Put another way, Linder & Peters (1984) argue that to engage in policy design and analysis, we need to consider three dimensions: (1) causation, (2) intervention (or instruments or tools), and (3) evaluation.

First, the model of causation allows us to associate certain outcomes in society with certain initial states; for example, a virus causes a disease. However, there may be alternative models of causation: a disease may result from an imbalance of hormones in

the body or from genetic mutations. Second, the mode of intervention guides us in selecting the tools or instruments to be used as part of the policy. Policy instruments are especially significant in this process as they are the techniques for implementing the policy. Instruments are the focus for policy design. Third, the model of evaluation allows us to map the outcomes of the policy process into a set of normative premises or values about the policy. These values may relate to broad concepts (e.g., justice, equality) or they may be more policy specific (e.g., efficiency). Unless the policy is based on a clear and accurate theory of the change that is needed to achieve the desired goal, the policy is not likely to successfully achieve the intended outcomes.

To summarize the three design elements, we must understand why the observed problem exists (causation), the array of instruments available to implement the proposed solution to the problem (intervention), and we must also consider the extent to which the policy reached its intended goals (evaluation). Innovative policy design requires that the parameters of instrument choice be well understood, both in order to reduce the risk of policy failure and enhance the probability of policy success (Linder & Peters, 1991; Schneider & Ingram, 1997).

Identifying the underlying factors contributing to poor maternal mental health can help improve care and create policy tools that properly address the issue. The design of policy is an important step in building effective systems of maternal mental health care, but the policy must be carefully designed to address the key drivers of the problem. Further, as described previously, unless there is a strong understanding of how the policy will be implemented, the policy may not be effective.

Any program and policy tool for addressing maternal mental health will not be independent agents for change, but will operate within open systems, interacting with personal, interpersonal, and environmental factors. Further, understanding the causal theories surrounding maternal mental health can help elucidate which policy tools—methods through which government seeks a policy objective (Elliott & Salamon, 2002), such as laws and regulations, direct provision of services, capacity-building tools, learning tools—may best address the issues and reduce the prevalence of maternal mental health disorders.

The design of policies, programs, and interventions to improve maternal mental health should be informed by the best available evidence; in reality, social, political, economic, community, family, and individual factors all play a role in interventions' effectiveness. As with many other health and social issues, maternal mental health is complex and has multiple factors that affect it at both the individual and societal level. Solutions to improve maternal mental health need to have multiple, interconnected components delivered directly to the mother and targeted at families, communities, and populations.

1.5 Contribution of this Research

Most research studies related to maternal depression focus on the immediate postpartum period and up to a year after birth, but this study advances the research by examining a cohort of mothers at three years postpartum. Combining PRAMS and CUBS data for a more longitudinal perspective allows me to better understand maternal depression beyond one year postpartum. I provide a more comprehensive description of the burden of maternal depression, which is needed to draw attention to this often-

overlooked issue. Describing the context and setting the stage and understanding its impact will drive future efforts. With the understanding that (1) knowledge shapes policy; (2) politics shapes knowledge; and (3) policy entrepreneurs and actors may use this knowledge when the timing is right, I hope to produce a menu of feasible policy tools that policymakers can draw upon when they have the opportunity (Kingdon, 2003). Ultimately, I want to spur systemic change by designing policy to promote the adoption of robust, evidence-based practices for the prevention, screening, and treatment of maternal mental health disorders.

Within the policymaking process, this research will serve the following stages: (1) problem identification and definition, (2) agenda setting, (3) policy formulation, (4) policy legitimation. I hope that it will eventually lead to policy implementation and policy evaluation.

In the State of Alaska, key stakeholders and policymakers have indicated that this is an issue of interest. Based on this research, I intend to develop several products for dissemination, including an issue brief for policymakers and presentations at Alaska-based public health and policy conferences. While I focus on examining Alaska as part of an in-depth case study in this research, there are national implications from this work. I will examine proposed and enacted policies from other states to see which aspects of them could be adapted or used in Alaska.

CHAPTER 2: LITERATURE REVIEW

2.1 An Overview of Maternal Depression

Mental health conditions are one of the leading causes of pregnancy-related death. Often, maternal mental illness is an underlying factor in homicide, suicide, accidental death, and accidental drug overdose (Alkema et al., 2016). Maternal mental health includes a range of conditions with varying severity and prevalence, such as depression, anxiety disorders, bipolar disorder, and postpartum psychosis. Illnesses can occur for the first time during the perinatal period, or they can exist before conception, continuing or worsening during and after pregnancy (Meltzer-Brody et al., 2018). Although many mothers experience emotional adjustments and transient mood swings in the immediate period following childbirth—sometimes known as the "baby blues"—this is very different from depression, which is much more severe and can be long-lasting. Depression is a serious medical condition that affects brain functioning and typically limits one's ability to carry out everyday activities. Postpartum depression is discussed most often and it limited to up to one year after delivery. However, I believe we should monitor mothers' mental health leading up to and during pregnancy as well as after pregnancy. In this study, I use the all-encompassing term maternal depression to include the spectrum of depressive symptoms that can affect women expecting mothers and mothers up to three years after delivery.

Mothers with maternal depression experience feelings of extreme sadness, anxiety, and exhaustion that may make it difficult for them to complete daily care activities for themselves or for others. Symptoms of maternal depression include loss of interest and energy, depressed mood, fluctuations in sleep or eating patterns, reduced

ability to think or concentrate, feelings of worthlessness, withdrawing from family, and recurrent suicidal ideation. In addition to these typical symptoms of depressive disorders, other symptoms in the perinatal period may include persistent doubt of the ability to take care of the infant, trouble bonding with the infant, and thoughts of self-harm or harm of the infant (Fitelson, Kim, Baker, & Leight, 2011). To be clinically diagnosed with maternal depression, symptoms of loss of interest and energy and depressed mood must be present for at least two weeks. Women who have previously had episodes of depression or anxiety are especially vulnerable and susceptible to developing maternal depression (Farr, Bitsko, Hayes, & Dietz, 2010; Guintivano, Manuck, & Meltzer-Brody, 2018)

Mothers' experiences of depression may differ in timing, severity, and duration (Campbell, Cohn, & Meyers, 1995; Goodman, 2007). For many women, depression episodes may last a couple of months, but for others, depression can become a chronic condition. Some mothers may experience depression primarily during their children's infant and toddler years; others endure depression that is prolonged or recurs over many years of a child's life. The majority of information on the prevalence of maternal depression comes from studies examining mothers within a year of childbirth, but data suggests that mothers may develop depression throughout the early years a child's life (Goodman, 2007; McCue Horwitz, Briggs-Gowan, Storfer-Isser, & Carter, 2007).

2.2 Prevalence of Maternal Depression in the United States

Because symptoms often go unreported and untreated, prevalence of mental health disorders such as maternal depression and anxiety are difficult to estimate (Byatt, Xiao, Dinh, & Waring, 2016). Estimates also vary based on the criteria and method of

assessment (e.g., diagnosis and medical chart review or self-report in population-based surveys), time period, and population. A meta-analysis from 1996 reported an overall prevalence of 13% of postpartum depression among mothers in the United States (O'Hara & Swain, 1996), and a more recent large-scale systematic review in 2005 reported a period prevalence of 19% for major and minor depression in the first three months postpartum (Gavin et al., 2005).

Based on clinical diagnostic information, Gavin et al. (2005) found that 18% of pregnant women were depressed during their pregnancy, and as many as 19% of new mothers had depression in the first 3 months after delivery. Using the Edinburgh Postnatal Depression Scale (EPDS; Cox, Holden & Sagovsky, 1987), Mayberry, Horowitz and Declercq (2007) found that between 17% and 23% of new mothers reported moderate-to-severe levels of depressive symptoms at any point in two years after childbirth. This translates to more than 400,000 babies born each year to American women experiencing depression (Earls, 2010) and an estimated 15 million children living with a mother experiencing depression (National Research Council and Institute of Medicine, 2009).

Based on self-report from population-based surveys, researchers estimate that 13 million women experience depression during pregnancy and in the postpartum period (Farr et al., 2010; Gavin et al., 2005; Ko, Rockhill, Tong, Morrow, & Farr, 2017). Data from the U.S. Centers for Disease Control and Prevention (CDC) PRAMS has shown that nationally, about 1 in 9 women experience postpartum depressive symptoms. CDC reported that in 2012, the overall prevalence of postpartum depressive symptoms was 12% across 27 states, ranging from 8% (Georgia) to 20% (Arkansas) (Ko et al., 2017).

The CDC estimates are based on mothers who completed the PRAMS survey between two to nine months after delivery. Women are asked two questions about frequency in experiencing depressive symptoms since the baby was born.

Higher prevalence of maternal depression has been reported among socially disadvantaged groups of women. Studies of adolescent mothers have reported prevalence of postpartum depression at 53 and 56 percent (Ko et al., 2017). Among low-income women, the prevalence of postpartum depression is nearly double that of the general population (Ko, Farr, Dietz, & Robbins, 2012). In addition, a North Carolina study of a racially-mixed U.S. population found depression in 19% of Native American women, 18% of White women, and 15% of African American women (Wei, Greaver, Marson, Herndon, & Rogers, 2008).

As demonstrated by the drastically different estimates from these studies, we do not have a solid understanding of disease burden. Being able to quantitively estimate the proportion of women suffering from maternal depression and explain differences in the distribution of between populations helps policymakers and healthcare administrators assess the need for services and treatment. The lack of recent population-based prevalence estimates is a barrier to the development and implementation of screening and treatment of maternal depression and promotion of well-being. Policy design efforts will depend on more updated estimates to catalyze action.

2.3 Prevalence of Maternal Depression in Alaska

In 2016, 23% of all Alaskan women delivering live births experienced symptoms of maternal depression, a decline from 27% in 2008 (McLaughlin, Hogan, Erickson, & Gessner, 2009). Studies have reported that maternal depression in Alaskan

Native/American Indian (AN/AI) women range from 14% to 29% (Baker et al., 2005; Ertel, Rich-Edwards, & Koenen, 2011; Segre, Losch, & O'Hara, 2006; Wei et al., 2008). While there is concern for the accuracy of these reports due to the lack of a culturally- and linguistically-appropriate depression screening tool for use with AI/AN women, their potentially higher prevalence suggests a racial/ethnic disparity. Health disparities research is a national public health priority (Bauer & Plescia, 2014) and there is a need to understand how maternal depression affects racial/ethnic groups in Alaska, including Alaska Native, Asian/Pacific Islander, and Hispanic women. In addition to racial/ethnic disparities in health, health disparities in mental health and maternal depression can be considered along the dimensions of socioeconomic status, age, and rurality.

2.4 Model of Maternal Depression

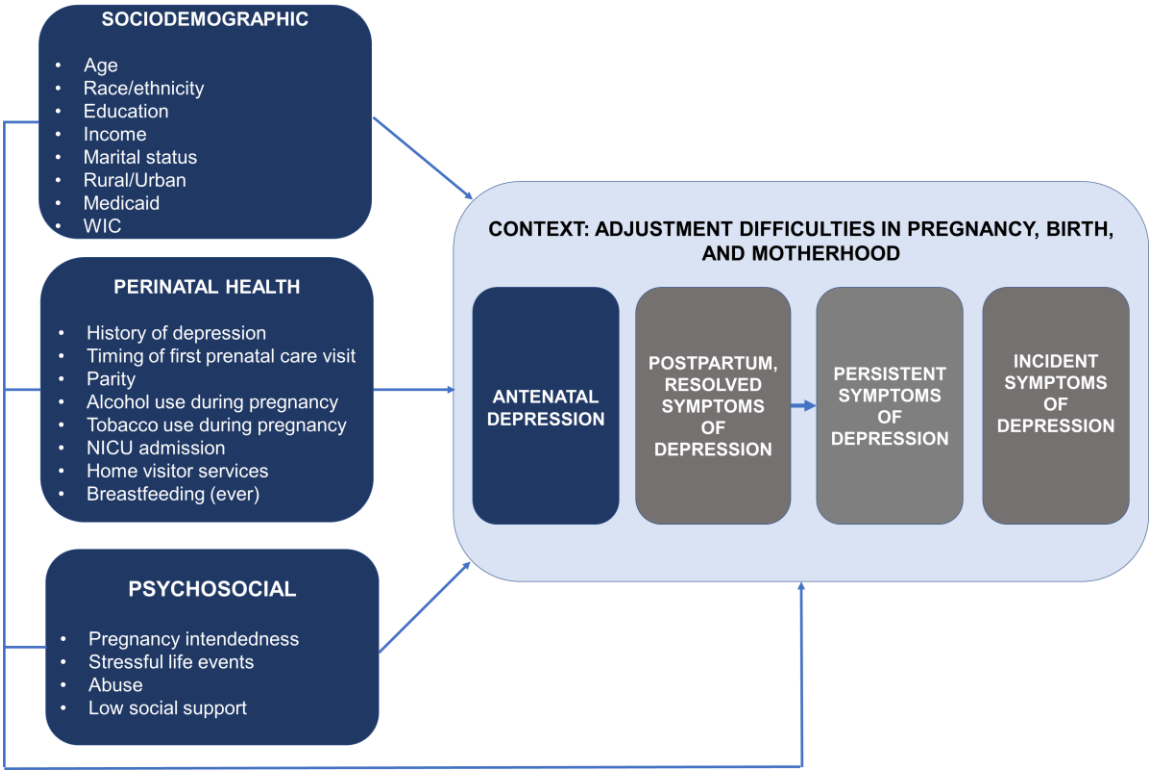
Early research on maternal depression focused primarily on the postpartum period and only on etiology (Bloch, Daly, & Rubinow, 2003; Blum, 2007; Hendrick, Altshuler, & Suri, 1998; Nierop, Bratsikas, Zimmermann, & Ehlert, 2006; Zonana & Gorman, 2005). These studies examined the biological aspects of women, such as the hormones and biological changes that occur during pregnancy and childbirth (Barnes, 2006). Studying the biological risk factors for postpartum depression is important for understanding the physical and chemical changes which can affect a woman's mood during this time and informing medical treatment (Nierop et al., 2006). However, these studies did not consider the context of a woman's life and overlooked the psychological and social aspects of depression during the entire perinatal period—including before and during pregnancy. Ross, Sellers, Gilbert Evans, & Romach (2004) showed that even though there is a strong association between certain biological risk with symptoms of

depression and anxiety, it does not independently cause maternal depression once psychosocial factors are integrated into the model.

Based on empirical research, Leigh & Milgrom (2008) developed a psychosocial model for maternal depression. Leigh and Milgrom screened 367 women at three different perinatal time points, including twice antenatally and once postpartum. They identified significant risk factors for antenatal depression and postpartum depression. Significant predictors for antenatal depression included: low self-esteem, antenatal anxiety, low social support, negative cognitive style, major life events, low income, and history of abuse. Significant predictors for postpartum depression include antenatal depression and a history of depression. Data from the Alaska PRAMS and CUBS do include at least six of these predictors, though self-esteem, anxiety, cognitive style is not available.

A study modeling psychosocial and lifestyle predictors of maternal depression using machine learning methods and sophisticated regression models by English et al. (2018) support and expand on the psychosocial model proposed by Leigh and Milgrom (2008). I use the model resulting from both Leigh and Milgrom (2008) and English et al. (2018) to further connect risk and protective factors to maternal depression. These factors form the basis of my analysis. Looking beyond the postpartum period, I add a time period for persistent symptoms of depression (Figure 1).

Figure 1. A psychosocial model of maternal depression, modified from Leigh and Milgrom (2008) and English et al. (2018)



2.5 Risk Factors for Maternal Depression

No single factor causes maternal depression, and the condition is likely a result of a combination of biological, genetic, environmental, personal, and psychosocial factors. I focus on the psychosocial risk factors here, elaborating on the Leigh and Milgrom (2008) model and reorganizing some of their originally-termed predisposing factors as sociodemographic and perinatal health characteristics. This comprehensive examination of the psychosocial risk factors and a longitudinal outlook may provide more options for policy design and instruments.

In the following section, I examine a variety of risk factors identified in the literature, organized by sociodemographics, perinatal health, and psychosocial characteristics. Much of the literature focuses on risk factors for postpartum depression,

though there appears to be a growing number of studies that examine depression during pregnancy. Similar to the literature on prevalence of maternal depression, results on predictive factors vary widely depending on whether women are assessed for depressive symptomatology or the diagnosis of major depression. Results on risk factors also vary widely depending on the time period at which a woman is assessed, and whether she is assessed for antenatal, postpartum, or general maternal depression.

The evidence around risk factors for maternal depression is often conflicting, but there are a few clear, unequivocal predictors that are strongly associated with maternal depression. Two meta-analyses (Beck, 2001; Robertson, Grace, Wallington, & Stewart, 2004) and one systematic review (Lancaster et al., 2010) have identified three consistent risk factors for depressive symptoms during pregnancy and postpartum: personal and family history of depression, low social support, and stressful life events.

2.5.1 Sociodemographic Characteristics

The most studied risk factors of maternal depression are sociodemographic characteristics, likely because data are widely accessible from large, population-based surveys. Below, I review the literature related to age, race/ethnicity, socioeconomic status, marital status, and rural/urban residence. Among the studies in the published and grey literature, the results are mixed on sociodemographic factors' association with maternal depression. Some studies show strong associations between variables and depressive symptoms, and some show little to no associations. Others show the interconnectedness of sociodemographic factors. For example, mothers with lower income, education, and employment status have a greater likelihood of developing postpartum depression, perhaps because they commonly are younger, have lower social

support, and are more likely to be single parents (Dolbier et al., 2013).

Age

The literature on the association between age and maternal depression is inconclusive. While a number of studies have found that young mothers are more likely to experience maternal depression (Katon, Russo, and Gavin 2014; Wang, Tiejian, Anderson, and Florence 2011; Boyce and Hickey, 2005), other studies have found that age is not a significant predictor of postpartum depression (Boivin et al., 2009; McMahon et al., 2015). A large study involving 1,897 women found that those under 25 years were five times more likely to have postpartum depression at six weeks postdelivery than those 25 and older (Sword et al., 2011). In a prospective cohort study of 2,128 mothers and child pairs, young maternal age was associated with greater risk of both antenatal and postpartum depressive symptoms (Rich-Edwards et al., 2006). The researchers link younger maternal age and financial hardship, unwanted pregnancy, and lack of a partner with maternal depression (Rich-Edwards et al., 2006). A comprehensive review of additional studies show that age and postpartum depression have a U-shaped curve, in that the risk of depression is higher under the age of 24, decreases between the ages of 24-35, and increases again over the age of 35 (Jerry Guintivano et al., 2018; Mirowsky & Ross, 2002). These age-specific changes may reflect periods of stressful life events and social support.

Race and ethnicity

The relationship between race and ethnicity and mental health is complex, likely because it is confounded by many other sociodemographic characteristics. Wang and colleagues (2011) found that mothers who are Black and poor were associated with an increased prevalence of depression compared to women in other categories. Segre et al.

(2006) found that more Black and Native American women reported depression than White, Hispanic, and Asian women. When important social factors such as age, income, education, marital status, and baby's health were controlled for, Black women still had significantly increased risk for reporting depressed mood in late pregnancy and the early postpartum period (Segre, O'Hara, & Losch, 2006). Similarly, Howell et al. (2005) found significantly increased risk of depression in Black (odds ratio [OR] 2.16) and Hispanic (OR 1.89) women relative to White women, controlling for major demographic differences. Contradicting these results though, Ertel, Rich-Edwards, and Koenen (2011) found that Black race and Hispanic ethnicity were protective factors, with 0.53 and 0.63, respectively, odds of depression compared to white mothers in similar socioeconomic and marital situations. However, Ertel et al. also found that Black and Hispanic depressed mothers were more likely to experience multiple adversities and less likely to receive services than white depressed mothers (2006).

In examining racial differences specifically, results from the PRAMS Survey of New York City mothers have shown that that Asian/Pacific Islander women were 3.2 times more likely be diagnosed with postpartum depression than White women, after controlling for other sociodemographic variables (Liu, Giallo, Doan, Seidman, & Tronick, 2016). There is some literature showing that immigration and discrimination increases risk of postpartum depression (Daoud et al., 2019; Daoud et al., 2014; Gaillard, Le Strat, Mandelbrot, Keita, & Dubertret, 2014). Issues of immigration and discrimination may account for the variation in prevalence of maternal depression across racial and ethnic groups, especially where increased prevalence is observed among immigrants or other groups experiencing discrimination (J Guintivano et al., 2018;

Stepanikova & Kukla, 2017). One study found that among women with low education levels, perceived discrimination in pregnancy was associated with a 2.43 times higher odds of postpartum depression (Stepanikova & Kukla, 2017).

While the studies mentioned above show associations between race and maternal depression—and by extension, discrimination and maternal depression—other studies show that after controlling for other factors, race was not a significant predictor of postpartum depression (Dolbier et al., 2013). Studies have conflicting results; for example, one study concluded that Hispanic women have increased risk of maternal depression, while another showed that they were at significantly decreased risk of depressive symptoms when compared to White women (Segre et al., 2006). Again, the relationship between race/ethnicity and maternal depression is complex and there are many mechanisms at play.

Socioeconomic status

Socioeconomic status (SES) is a composite measure that includes income, education, employment, and insurance status. These interrelated factors can influence the development of maternal depression (Mayberry, Horowitz, & Declercq, 2007). For instance, mothers with lower income, education, and employment status have a greater likelihood of developing postpartum depression, perhaps because they commonly are younger, have lower social support, and are more likely to be single parents (Adler & Snibbe, 2003). Overall, SES is a significant predictor of postpartum depression, with low SES being a strong risk factor (Dolbier et al., 2013). Within SES, income is one of the largest predictors of postpartum depression. Research has shown that up to half of low-income women may suffer from postpartum depressive symptoms (Boury, Larkin, &

Krummel, 2004) Many studies have found that low household income increases the odds of developing postpartum depression, and poverty is positively associated with maternal depression (Wang, Wu, Anderson, & Florence, 2011). Peterson & Hawley (1998) found that low income and worry about finances can be a significant stressor for mothers. Low income was also associated with poorer parental coping skills, lower family cohesion, less empathy, and inability to reverse roles within the family (Peterson & Hawley, 1998). On the other hand, higher household income is protective factor, providing families with options, including better access to healthcare and other essential services and items.

While it seems like there is a clear relationship between SES and maternal depression, in their meta-analysis, Lancaster et al. (2010) found inconsistent results for income and education. Researchers found that lower income had a small correlation with depressive symptoms in bivariate analysis, but that relationship disappeared in multivariate models.

Marital status

Beck's often-cited meta-analysis (2001) revealed that marital status is associated with maternal depression, though the magnitude of that association appeared to be small. Additional studies have added that the quality of the relationship with the father of the baby is a more meaningful predictor. After controlling for relationship quality, single women were no more likely to be depressed compared to married or cohabiting women (Akincigil, Munch, & Niemczyk, 2010). In another prospective cohort study, researchers found that low relationship satisfaction during pregnancy was a significant predictor of postpartum depression among first-time mothers (Mesina, Kjerulff, Deimling, Phaeton, & Repke, 2017). Relationship quality is difficult to measure though, and many studies

continue to use marital status as a proxy indicator, as that that information is readily available.

Rural/urban residence

There is limited research on the mental health of rural women in the United States. One literature review conducted in 2016 included 11 articles with empirical data on postpartum depression in rural areas (Mollard, Hudson, Ford, & Pullen, 2016). The authors of that review found that prevalence of postpartum depression may be higher in rural areas in the United States, and women living in rural areas may lack social support. In addition, women living in rural areas rely on informal networks and may face stigma for seeking mental health care (Mollard et al., 2016).

Nidey et al. (2020) used data from PRAMS across 14 states to examine the association between rural-urban status and the risk of depression during the perinatal time period. They found that the odds of maternal depression risk were higher among rural versus urban women after adjusting for race, ethnicity, and maternal age (OR 1.21, 95% confidence interval [CI] 1.05-1.41). However, this risk difference became smaller and not significant when adding maternal education, health insurance coverage, and WIC participation (Nidey et al., 2020). In general, rural individuals are at greater risk for poor health outcomes (Meit et al., 2014), due to factors such as low educational attainment (Johnson, Showalter, Klein, & Lester, 2014) and increased rates of poverty (Kusmin, 2013).

2.5.2 Perinatal Health

History of depression

As noted in the psychosocial model of maternal depression and emphasized by Leigh and Milgrom (2008) and English et al. (2016), a history of depression or antenatal depression is a major risk factor for postpartum depression. The research literature includes many prospective and retrospective studies showing psychiatric history as the most significant predictor of maternal depression (Guintivano et al., 2018). Many studies have shown the strong association between antenatal depression, antenatal anxiety, history of mental illness, and maternal depression. A previous history of mental illness, in particular a history of anxiety and depression and a history of psychiatric treatment during a previous pregnancy or at any time during the lifetime, is also a well-established risk factor in the development of antenatal anxiety and depression (Biaggi, Conroy, Pawlby, & Pariante, 2016; Milgrom, Hirshler, Reece, Holt, & Gemmill, 2019; Rich-Edwards et al., 2006; Rubertsson, Hellström, Cross, & Sydsjö, 2014). However, it is important to note that while a history of depression is likely the strongest risk factor for a new episode during pregnancy, one study found that half of the women who were depressed during pregnancy had never been depressed before (Räisänen et al., 2014). This suggests that many women without a history of depression may encounter their first episode during pregnancy and should not be overlooked.

Birth and delivery

Blom et al. (2010) found that women experiencing a range of health complications during pregnancy and emergency cesarean section were more likely than other women to have depression at two months postpartum. These effects remained

significant when controlling for sociodemographic variables and psychiatric history. Further, there is evidence that postpartum depression symptomatology may be influenced by infant health (Blom et al. 2010).

Breastfeeding

There are no definitive studies related to breastfeeding and maternal depression, though many have researchers suggest that breastfeeding is a protective factor against postpartum depression (Borra, Iacovou, & Sevilla, 2015). Some researchers have reported no relationship between breastfeeding and postpartum depression, and others have reported that breastfeeding mothers have a higher risk of depression (Pope & Mazmanian, 2016). We do not know whether breastfeeding reduces the risk of maternal depression or if, instead, successful breastfeeding is more prevalent among mothers at lower risk for maternal depression—such as those with fewer stressors and supports for breastfeeding. In one longitudinal, prospective study, researchers found that the relationship between breastfeeding and depressive symptoms was mediated by the mothers' plans to breastfeed (Borra et al., 2015). Mothers who did not have maternal depression and had planned and were able to successful breastfeed their babies had lowest risk of postpartum depression. The highest risk of postpartum depression was among women who had planned to breastfeed but did not breastfeed their babies (Borra et al., 2015). Further, others have found that depressed mothers are also less likely to breastfeed (Hernandez-Reif, & Feijo, 2002; McLearn, Minkovitz, Strobino, Marks, & Hou, 2006a).

2.5.3 Psychosocial Factors

Pregnancy intention

Abbasi et al. (2013) and Christensen et al. (2011) did not find any relationship between unintended pregnancy and postpartum depression. However, many other researchers have found that unplanned pregnancy is related to major episodes of postpartum depression and is often cited as a predictor of depression (Chee et al., 2005; Eilat-Tsanani et al., 2006; Ege et al., 2008; Kozinszky et al., 2011; Goker et al., 2012; Gaillard et al., 2014). A more recent study using PRAMS data found that women with mistimed or unwanted pregnancies were more likely to experience symptoms of postpartum depression. Specifically, women with mistimed pregnancies (wanted it sooner, or wanted it later) were 20-30% more likely to experience symptoms of postpartum depression, and women with unwanted pregnancies were 50% more likely experiences symptoms of postpartum depression (Gauthreaux et al., 2017). A cross-sectional study of 870 women found that women with unintended pregnancies had higher odds of experiencing stress (OR 1.72; 95% CI 1.22-2.41), depression (OR .83; 95% CI 1.04-3.20), and initiation of prenatal care post-first trimester (OR 1.84; 95% CI 1.23-2.74).

Stressful life events

Meta-analyses and many studies have identified stressful life events during pregnancy as a predictor of maternal depression (Beck, 2001; Robertson et al., 2004). A systematic review of 57 articles published from 1980 to 2008 concluded that increased stress was associated with depressive perinatal symptoms in bivariate and multivariate analyses (Lancaster et al., 2010). In one study of 3,011 women, those with more than two

stressful life events within the past year were 3 times as likely to report depressive symptoms (Lancaster et al., 2010). Using data from PRAMS, researchers found that among women in New York City, those who experienced six or more stressful events during the year before delivery had three times the odds of having a postpartum depression diagnosis, compared with those who did not experience any stressful event (Liu & Tronick, 2013). There is a dose-response relationship, where depressive symptoms were more than five times among women who reported having experienced seven or more antenatal stressful life events, compared to those who experienced none (Mukherjee, Coxe, Fennie, Madhivanan, & Trepka, 2017).

Similarly, in Massachusetts, women reporting stressors during pregnancy had a significantly higher prevalence of depressive symptoms (Stone et al., 2015). Further, Mukherjee, Coxe, Fennie, Madhivanan, & Trepka (2017) found that experiencing financial stressors was an important factor of depressive symptoms, even after adjusting for enrollment in WIC services and Medicaid use, which reduced the adjusted odds of depressive symptoms. Types of stressors related to maternal depression include partner-related, traumatic, emotional, and financial, and these overlap with other predictors, such as intimate partner violence, marital status, social support, and income.

Intimate partner violence

The association between having experienced intimate partner violence among women and high levels of depressive, anxiety, and post-traumatic stress disorder symptoms in the perinatal periods have consistently been reported in cross-sectional studies. Researchers have estimated between a 1.5 to 3-fold increase in the risk of elevated depressive symptoms and maternal depression among women exposed to

intimate partner violence versus non-exposed women (Alvarez-Segura et al., 2014, Beydoun et al., 2012). In a meta-analysis from 2013, pooled estimates from longitudinal studies suggest a three-fold increase in the odds of depressive symptoms among mothers after having experienced partner violence during pregnancy (OR 3.1, 95% CI 2.7–3.6) (Howard, Oram, Galley, Trevillion, & Feder, 2013). Biaggi et al. (2016) summarized that 28 studies have found intimate partner violence and history of abuse as significant risk factors for maternal depression and anxiety. The results suggest a two-way association between intimate partner violence and antenatal depression: intimate partner violence is associated with depression during pregnancy, and depressive symptoms can increase the likelihood that the woman may experience violence (Biaggi et al., 2016; Howard et al., 2013).

Social support

Many studies have linked social support and maternal depression. Women with lower social support report more depression symptoms than women with higher social support (Biaggi et al., 2016; Milgrom et al., 2019). Maintaining quality relationships, particularly with a partner, and having strong social support are protective factors against maternal depression (Escriba-Aguir and Artazcoz, 2011; Robertson et al., 2004). A social support network can include friends, family and peers. Support networks reduce isolation and loneliness, improve the ability to cope with stress and adverse life events, and provide physical and emotional comfort. After reviewing the literature, Shrivastava, Shrivastava, & Ramasamy (2015) conclude that the most important contributor to maternal depression is the lack of family support. They suggest that the presence of a healthy and supportive family, especially support from a partner or husband, can override

other risk factors.

2.5.4 Other Potential Risk Factors of Maternal Depression

Lancaster's meta-analysis revealed inconsistent findings for a number of other factors as they relate to maternal depression: smoking, alcohol use, and parity (first-time mom). Biaggi et al. (2016) also found no or inconsistent evidence for any association between maternal depression and anxiety and alcohol and substance abuse. However, psychosocial risk factors often manifest as drug, alcohol, and tobacco use. Previous studies have suggested first-time mothers may be at higher risk of maternal depression (Smorti, Ponti, & Pancetti, 2019). First-time mothers tend to be less confident in their new role and have greater difficulty in early interactions with their babies, leading to anxiety and postpartum depression (Righetti-Veltema, Conne-Perréard, Bousquet, & Manzano, 2002). Other studies found that the number of children had no significant influence on the development of maternal depression (Figueiredo & Conde, 2011). There is also inconclusive evidence around prenatal care initiation and maternal depression. One study of 2,379 women at five community health centers found that depressive symptoms were not independently associated with late prenatal care but were negatively associated with less than adequate prenatal care. (Sidebottom, Hellerstedt, Harrison, & Hennrikus, 2014)

2.6 Impact of Poor Maternal Mental Health

2.6.1 Effects of Perinatal Depression on the Mother

During pregnancy, maternal depression is associated with preterm birth, low birth weight, and cognitive and developmental delays of the baby (Grote et al., 2010). When left undetected or inadequately treated, maternal depression may lead to persistent or

chronic depression for the mother. Depression may increase the likelihood of certain disease conditions both during the maternal part of her lifecycle as well as throughout her entire life course. For example, depressed women are more likely to have cardiovascular disease (Farr et al., 2011; Pan et al., 2011; Wuslin, 2004), stroke (Rexrode, 2010) and type-2 diabetes (Bowers et al., 2013; Farr et al., 2011; Mezuk et al., 2008; Pan et al., 2011). Some studies have found that women with major depression to be 3.6 times more likely than nondepressed women to have diabetes and chronic disease risk factors (Farr et al., 2011) and 1.45 times more likely to have a stroke (Pan et al., 2011). Depressed mothers also report higher incidences of intimate partner violence, rape, child abuse (Ammerman, Putnam, Bosse, Teeters, & Van Ginkel, 2010); however, these are often also predictors of maternal depression, making it difficult to tease out the exact mechanism behind the mental disorder. Further, infants of mothers with maternal depression are more likely to be abused, neglected, become hospitalized with health issues, and to be diagnosed with failure to thrive (Letourneau et al., 2012). Adverse childhood events can cascade to cognitive, social-emotional, and behavioral issues in children.

Women with maternal depression may be at greater risk for substance use—such as alcohol and nonmedical use of prescription drugs like opioids—compared to postpartum women without depression. In particular, new mothers may use substances to alleviate the symptoms of depression, improving their mood and relieving stress and anxiety. The Substance Abuse and Mental Health Services Administration (SAMHSA) has reported that nearly 15 percent of women who are less than a year from the birth of their child and had postpartum depression engaged in binge drinking, whereas nearly 9

percent of this group reporting abusing other drugs (SAMHSA, 2008). Studies have shown that substance use and depressive disorders are risks for each other; depression may increase the risk of substance use, and substance use may increase the risk of depression (Swendsen & Merikangas, 2000). Both conditions likely reduce a woman's ability to care for her infant and also negatively affect maternal and child health (Homish, Cornelius, Richardson, & Day, 2004). While alcohol is the most common substance misused, opioid and heroin dependence is a growing public health crisis. In Alaska, the incidence of neonatal opioid withdrawal syndrome among Medicaid-enrolled births (for which complete and long-term data is available) increased 581% from 2.7 births per 1,000 in 2004 to 18.4 in 2015 (McLaughlin & Castrodale, 2017). Because substance abuse and poor mental health often co-occur, this is an issue that may be addressed jointly.

Although acts of harming oneself or the child are rare, maternal depression increases the risk of suicide and suicidal ideation, and mothers with depression report more thoughts of harming their infants than mothers without depression (O'Connor, Senger, Henninger, Coppola, & Gaynes, 2019). The risk for suicidality is significantly higher among depressed women during the perinatal period. Consequently, suicide is the second most common cause of mortality in postpartum women (Wisner et al., 2013). Suicides account for up to 20% of postpartum deaths (Lindahl, Pearson, & Colpe, 2005).

Women with maternal depression tend to use more negative parenting behaviors (e.g., hostile or coercive behaviors or both) and less positive parenting behaviors, such as praising and playing with their child (Curry et al., 2019). All these undesirable parenting behaviors affects a child's cognitive and emotional development, resulting in more

behavior problems, lower cognitive functioning, and increased risk of developing psychiatric disorders. Relative to their non-depressed counterparts, depressed mothers have been found to be disengaged from their children (Radke-Yarrow, Nottelmann, Belmont, & Welsh, 1993), unable to modulate affect or behavior during mother-child interactions (Field et al., 2007), insensitive to child cues regarding needs and emotional states (Field, 2002), more negative and less positive during interactions (Palaez, Field, Pickens, & Hart, 2008), and talk less to their children (The National Institute of Child Health and Human Development Early Child Care Research Network, 2005). Depressed mothers read less to their children (Kavanaugh et al., 2006) and are less likely to engage in play (Bigatti, Cronan, & Anaya, 2001).

2.6.2 Outcomes of Untreated Perinatal Depression on the Child

Research has shown that mothers with depressive symptoms are less attentive to health and prevention needs: infants are less likely to get routine well-child care and less likely to receive up-to-date immunizations (Minkovitz et al., 2005). Depressed mothers are less likely to provide a safe environment including using car seats, safety latches, and electric outlet covers (McLearn, Minkovitz, Strobino, Marks, & Hou, 2006b). Perinatal depression also may lead indirectly to poor health outcomes for the child, such as increased risk for infant hospitalization (Chung et al., 2004), asthma morbidity (Pak & Jackson Allen, 2012). Chronic depression may be associated with child overweight (Lampard, Franckle, & Davison, 2014) and subsequent associated conditions, such as diabetes.

The Harvard Center on the Developing Child found that the architecture of children's brains was flawed when their mothers had experienced maternal depression

early in their children's lives (2009). When children grow up in an environment of untreated mental disorders and are exposed to maternal depressive symptoms, the development of their brains may be seriously weakened, with implications for their ability to learn as well as for their own later physical and mental health (Center on the Developing Child at Harvard University, 2009; Sohr-Preston & Scaramella, 2006).

Research indicates that maternal depression poses a serious risk to the quality of the parent-child relationship (Cummings et al., 2008; Elgar et al., 2007; Goodman & Gotlib, 1999; Lim et al., 2008), which in turn can threaten a child's physical, social, and cognitive development during early childhood (Davies, Winter, & Cicchetti, 2006; Sroufe et al., 2005). For instance, infants and young children of depressed mothers have increased risk for social and emotional problems (Moore, Cohn, & Campbell, 2001; Whitaker, Orzol, & Kahn, 2006) and delays or impairments in cognitive and linguistic development (Grace, Evindar, & Stewart, 2003; Downey & Coyne, 1990). These impairments or delays put children at greater risk of needing early intervention services related to cognitive and language delays. Additionally, mothers of children with developmental delays are more likely to experience depression (National Research Council and Institute of Medicine, 2009), potentially perpetuating the negative cycle and increasing short- and long-term costs associated with early intervention services.

Most of the literature about the effects of postpartum depression on children is based on maternal depression in the first postpartum year. Studies have shown both short-term and long-term effects of maternal depression on infant physical growth, cognitive development, and behavioral adjustment (Murray et al., 1999; Surkan, Ettinger, Ahmed, Minkovitz, & Strobino, 2012). For example, children of depressed mothers are more

likely to exhibit eating or sleeping difficulties (Righetti-Veltema, Conne-Perreard, Bousquet, & Manzano, 2002). A systematic literature review found that perinatal maternal mental health problems increased the likelihood that school-age children experienced suboptimal global, behavioral, cognitive, and socio-emotional development (Kingston & Tough, 2014).

Children of depressed mothers may be less likely to enter school ready to learn because of increased risk for early cognitive developmental delays and poor academic performance (Kersten-Alvarez et al., 2012; Sohr-Preston & Scaramella, 2006). For instance, children of depressed mothers show lower IQs during the early childhood years (Evans et al., 2012), potentially leading to greater need for special education services. Untreated maternal depression may increase risk for child maltreatment and neglect (Collishaw et al., 2007; Hazen et al., 2006; Koverola et al., 2005; Taylor et al., 2009) due to the lack of attentiveness and responsiveness associated with depression (Diego, Field, & Hernandez-Reif, 2005).

It is important to note that we do not fully understand the causal pathways between maternal depression and the more distal health outcomes for the child. There are likely a variety of pathways, though they all lead to less-than-ideal outcomes for children and families.

2.6.3 Cost of Untreated Maternal Depression and Poor Maternal Mental Health

Beyond being associated with increased use of health care resources (Agency for Healthcare Research and Quality, 2013), maternal depression is also associated with increased use of the public assistance system (Sontag-Padilla, Schultz, Reynolds,

Lovejoy, & Firth, 2013). Reducing the prevalence of maternal depression may have short- and long-term financial implications for the publicly funded systems that serve depressed mothers and their children. To assess the economic impact of not treating perinatal mood and anxiety disorders, researchers calculated costs from pregnancy through five years after childbirth and found that untreated maternal mental health conditions cost the United States $14.2 billion each year (Luca et al., 2019).

Untreated maternal depression has been associated with negative outcomes in the areas of employment and income, which has potential cost implications for the public assistance system. Depressed mothers are more likely to be unemployed (20% versus 8%) and less likely to be employed full time (40% versus 52%) when compared to nondepressed mothers (Ertel, Rich-Edwards, & Koenen, 2011). However, because these data were cross-sectional, the direction of the relationship remains unclear. In other words, it is difficult to decipher the extent to which depression causes unemployment versus unemployment leading to depression. Depressed mothers may also have difficulty obtaining and maintaining a job, leading to lower income and a greater need for public assistance (Ertel, Rich-Edwards, & Koenen, 2011; Kawakami et al., 2012; Lepine & Briley, 2011; Turney, 2011). For the general population, depression has been shown to be predictive of greater work disability in the short term and of lower income over time (Kawakami et al., 2012; Lepine & Briley, 2011).

Treatment of depression has been shown to improve work productivity and decrease absenteeism (Rost, Smith, & Dickinson, 2004; Schoenbaum et al., 2002; Wang et al., 2006), underscoring the need to identify and treat maternal depression to reduce financial burden on families. Given the costs associated with unemployment and low

income—such as Temporary Assistance to Needy Families, Supplemental Nutrition Assistance Program, assistance from Women, Infants and Children—reducing the occurrence of maternal depression has potential cost savings implications for the public assistance system.

In addition to health consequences for mothers and children, poor maternal mental health is particularly burdensome in terms of maternal productivity loss and increased social services costs. Recent evidence suggests that identifying depressed mothers early and reaching them with effective, evidence-based treatments may offset some short- and long-term costs for public-sector systems by reducing the likelihood that mothers and children will need service or supports. Despite the apparently high prevalence of depression among new mothers, large numbers of affected women and their children go unidentified, and an estimated 85 percent do not seek treatment (Center on the Developing Child at Harvard University, 2009). Although the potential costs associated with untreated maternal depression may be reduced or eliminated by focusing additional resources on the identification and treatment of depression, prevention efforts to reduce risk for, and incidence of, maternal depression may be just as valuable if not more cost-effective (Center on the Developing Child at Harvard University, 2009).

2.7 Detection and Treatment of Perinatal Depression

Early detection of and referrals for maternal depression can help prevent the negative outcomes associated with untreated poor mental health. Identification of and treatment for maternal depression may improve short- and long-term outcomes for both mothers and their children (Center on the Developing Child at Harvard University, 2009; Cicchetti, Rogosch, & Toth, 2000; Clark, Tluczek, & Wenzel, 2003), and early detection

and referrals is especially important for low-income populations, who are less likely to receive treatment for depression (Claessens, Engel, & Curran, 2015; Olfson et al., 2002). Over the past decade, national associations like the U.S. Preventive Services Task Force (USPSTF), American College of Obstetricians and Gynecologists (ACOG), and American Academy of Pediatrics (AAP) have issued guidelines to ensure adequate screening for perinatal and postpartum mental health disorders (see Table 2). These guidelines have not been universally implemented. One reason may be because no one has specified a single screening tool to use. A second reasons may be because providers are reluctant to screen when access to mental health services is limited or nonexistent.

Table 2. Screening recommendations for maternal depression (adapted from *A Report from the California Task Force on the Status of Maternal Mental Health Care, April 2017)*

Expert Organization	Recommendation
U.S. Preventive Services Task Force (USPSTF)	Recommends screening for depression in the general adult population, including pregnant and postpartum women. Screening should be implemented with adequate systems in place to ensure accurate diagnosis, effective treatment, and appropriate follow-up.
U.S. Centers for Medicaid and Medicare Services (CMS)	Maternal depression screening during the well-child visit is considered a pediatric best practice and is a simple way to identify mothers who may be suffering from depression and may lead to treatment for the child or referral for mothers to other appropriate treatment.
American Congress of Obstetricians and Gynecologists (ACOG)	Recommends that clinicians screen patients at least once during the perinatal period for depression and anxiety symptoms using a standardized, validated tool. Screening should be coupled with appropriate follow-up and treatment when indicated.
Council on Patient Safety in Women's Health Care	Health care providers should (1) obtain from every woman an individual and family mental health history (including past and current medications) at intake, with review and update as needed; (2) conduct validated mental health screening during appropriately timed patient encounters to include both during pregnancy and in the postpartum period; and (3) provide appropriately timed awareness education to women and family members or other support persons.
American Academy of Pediatrics (AAP)	The primary care pediatrician, having a longitudinal relationship with families, has a unique opportunity to identify maternal depression and help prevent untoward developmental and mental health outcomes for the infant and family. Screening can be integrated into the well-child care schedule and included in the prenatal visit. This screening has proven successful in practice in several initiatives and locations and is a best practice for primary care providers caring for infants and their families. Intervention and referral are optimized by collaborative relationships with community resources and/ or by co-located/integrated primary care and mental health practices. Screening should occur by 1 month, and at 2 months, 4 months, and 6 months postpartum.
AAP/ACOG Guidelines for Perinatal Care	Prior to delivery, patients should be informed about psychosocial issues that may occur during pregnancy and in the postpartum period. A woman experiencing negative feelings about her pregnancy should receive additional support from the health care team. All patients should be monitored for symptoms of severe postpartum depression and offered culturally appropriate treatment or referral to community resources. Specifically, the psychosocial status of the mother and newborn should be subject to ongoing assessment after hospital discharge. Women with postpartum blues should be monitored for the onset of continuing or worsening symptoms because these women are at high risk for the onset of a more serious condition. The postpartum visit approximately 4-6 weeks after delivery should include a review of symptoms for clinically significant depression to determine if intervention is needed.

As an example, ACOG recommends that obstetric care providers screen patients at least once during the perinatal period for depression and anxiety symptoms using a standardized, validated tool. Further, if a patient is screened positive for depression and anxiety during pregnancy, additional screening should then occur during the comprehensive postpartum visit. They also recommend that clinical staff be prepared to initiate medical therapy, refer patients to appropriate behavioral health resources, or both (ACOG, 2018). Screening for maternal depression usually includes completing a written questionnaire or a brief interview by a health care provider. The EPDS and the Patient Health Questionnaire-9 are two of the most commonly used standardized and validated screening tools for depression, given their brevity and relatively high sensitivity to detecting depression (Table 3). However, there is no perfect screening tool for identifying who is at risk of maternal depression and who might benefit from preventive interventions.

Table 3. Screening tools for depression

Screening Tool	Number of Items	Time to Complete (minutes)	Sensitivity*	Specificity+
Edinburg Postnatal Depression Scale (EPDS)	10	Less than 5	59-100%	49-100%
Patient Health Questionnaire 9 (PHQ-9)	9	Less than 5	75%	90%
Postpartum Depression Screening Scale	35	5 – 10	91-94%	72-98%
Beck Depression Inventory (BDI)	21	5 – 10	48-82%	86-89%
Beck Depression Inventory – II	21	5 – 10	56-57%	97-100%
Center for Epidemiologic Studies Depression Scale	20	5 – 10	60%	92%
Jung Self-Rating Depression Scale	20	5 – 10	45-89%	77-88%

* Sensitivity is the ability of the screening tool to correctly classify an individual as having depression, or the probably of being tested positive when the disease is present.
+ Specificity is the ability of the screening tool to correctly classify an individual as disease-free, or the probably of being tested negative when the disease is absent.

For treatment, the USPSTF issued a new recommendation in February 2019 that clinicians provide or refer pregnant and postpartum persons who are at increased risk of maternal depression to counseling interventions (Curry et al., 2019). The USPSTF found convincing evidence that counseling interventions, such as cognitive behavioral therapy and interpersonal therapy, are effective in preventing maternal depression. Based on their systematic evidence review, they advise providing counseling interventions to women with 1 or more of the following risk factors: a history of depression, current depressive symptoms (that do not reach a diagnostic threshold), certain socioeconomic risk factors such as low income or adolescent or single parenthood, recent intimate partner violence, or mental health–related factors such as elevated anxiety symptoms or a history of significant negative life events.

Cognitive behavioral therapy focuses on the concept that positive changes in mood and behavior can be achieved by addressing and managing negative thoughts, beliefs, and attitudes and by increasing positive events and activities (O'Connor et al., 2019). Common therapeutic techniques include patient education, goal-setting, interventions to identify and modify maladaptive thought patterns, and behavioral activation. Interpersonal therapy focuses on treating interpersonal issues thought to contribute to the development or maintenance of psychological disorders. Common therapeutic techniques include the use of exploratory questions, role-playing, decision analysis, and communication analysis.

One barrier to access to treatment for maternal depression is coverage. While the ACA of 2010 has provided access to maternity and childbirth coverage through all health plans, that coverage is often limited. For example, Medicaid coverage in 14 states ends 60 days postpartum. As of August 2019, 37 states have extended Medicaid coverage for up to one year postpartum, and legislative efforts are underway to extend coverage in the remaining states (NCSL, 2019). The ACA also requires that all adults be screened for depression in systems that provide adequate follow-up. While it has well-meaning intentions, this global mandate does not guarantee successful local implementation, nor does it guarantee improved outcomes for women and children (Rhodes & Segre, 2013).

2.8 Summary of Research Questions to Address the Research-Practice-Policy Gap

This research aims to improve understanding of how and in what contexts programs and policies can be designed in order to reduce the prevalence of maternal mental health disorders. Below, I present my research questions, research objectives, and

how it aligns with policy design domains.

Table 4. Research questions and objective aligned to policy design theory

Research Questions	Research Objective	Policy Design
1. What is the prevalence of symptoms of maternal depression among women in Alaska who delivered between 2012-2014?	Describe the prevalence of maternal depression in Alaska	Characterizing the problem through context
a. How many women reporting postpartum symptoms of maternal depression continue to report persistent symptoms at 3 years postpartum?	Describe the prevalence of *persistent* maternal depression in Alaska (i.e., those who continued to experience symptoms of depression at postpartum and 2 years later)	Characterizing the problem through context
2. What sociodemographic, perinatal health, and psychosocial factors are associated with symptoms of maternal depression among women in Alaska?	• Examine the relationship between sociodemographic factors and maternal depression among women in Alaska • Examine the relationship and possible mechanisms between risk factors and maternal depression among women in Alaska	Causation through context and mechanisms
3. What policy and systems changes would encourage Alaskan women to access mental health resources?	Develop policy options to improve maternal mental health and specifically, to reduce the prevalence of maternal depression	Set of instruments, tools, interventions, or policies addressing context, mechanism, and outcomes

CHAPTER 3: METHODOLOGY

In this chapter, I describe the quantitative and qualitative approaches used in my research. I first describe the data collection procedures for Alaska Pregnancy Risk Assessment Monitoring System (PRAMS) and Childhood Understanding Behaviors Survey (CUBS) survey. I then define the dependent and independent variables and how they are operationalized for statistical analyses. I also explain my methods for statistical analyses and approach for the environmental scan.

3.1 Quantitative Data: Alaska PRAMS and CUBS

Using a retrospective observational cohort design, I study a cohort of women who gave birth between 2012 and 2014 in Alaska. I create a longitudinal dataset by linking two statewide survey data collected 2-6 months after birth and 3 years after birth. The survey data is from the 2012-2014 Alaska PRAMS and the 2015-2017 CUBS.

PRAMS is a surveillance project coordinated by the Centers for Disease Control (CDC) and state health departments to monitor attitudes, behaviors, and experiences before, during, and after pregnancy. PRAMS was designed to supplement data from vital records and to generate data for planning and assessing perinatal health programs in participating states. Because PRAMS data are population-based, findings from data analyses can be generalized to an entire state's population of women having a live birth. PRAMS is designed not only to generate state-specific data, but also to allow comparisons among states using standardized data collection methods. Forty-seven states currently participate in data collection for PRAMS. PRAMS is the only database that tracks the number of women screened for postpartum depressive symptoms across states and it has the most current data on rates of depression screenings (Wile, 2019).

Alaska PRAMS is a mail and phone survey that samples about one out of every six live births through a stratified random sample of birth certificates, with stratification conducted according to maternal Alaska native race and infant birth weight. Birth certificate data is linked to PRAMS and includes maternal race/ethnicity, education, and other demographics. Women from these groups are sampled at a higher rate to ensure adequate data are available in smaller but higher risk populations. Selected women are first contacted by mail 2 to 6 months after delivery of their baby. If there is no response to repeated mailings, women are contacted and interviewed by telephone (State of Alaska Division of Public Health, 2019). Data collection procedures and instruments are standardized to allow comparisons between states. Within each dataset, sampling and noncoverage weights, adjustment factors for nonresponse, and demographic information, obtained by linking to state vital records, are provided. This permits weighted analyses that will yield estimates of the prevalence of maternal depression in Alaska's population.

Alaska is 1 of only 4 states that conduct an ongoing follow-up survey (Oklahoma, Rhode Island, and Oregon are the other states). Through CUBS, Alaska collects data about the health status and care of Alaskan children at age 3. CUBS sends a follow-up survey three years later to all mothers who completed PRAMS and are still living in Alaska. CUBS asks questions about toddler behavior, health, health care access, parenting, and school readiness. CUBS also includes items specific to maternal and family experiences, such as maternal smoking and drinking habits; food security, family stressors; social support; and intimate partner violence. Through post-stratification weights, CUBS responses are weighted to be representative of the birth population for the

corresponding Alaska PRAMS year (e.g., the 2012 CUBS responses are weighted to reflect the 2009 Alaska birth population).

The average unweighted response rate for PRAMS is 72%, and the average unweighted response rate among eligible participants for CUBS data is 57%. Both PRAMS and CUBS have protocols for quality assurance, including 10% spot checks on all out-going mailings, 10% verification on mail survey data entry, and 10% monitoring of all phone calls. The PRAMS and CUBS data analyzed in this study were provided by the Alaska State Department of Health and Social Services, Alaska Division of Public Health, Section of Women's, Children's, and Family Health, Alaska Division of Public Health.

Linking the Alaska PRAMS and CUBS data provides a longitudinal dataset. Few previous studies have used longitudinal data to examine the prevalence and risk factors for maternal depression; only one other study has used population-based data from postpartum mothers (Blabey, Locke, Goldsmith, & Perham-Hester, 2009). As described earlier, research on the prevalence of maternal depression primarily examines mothers within a year of childbirth, but data suggests that mothers may develop depression throughout the early years a child's life (Goodman, 2007; McCue Horwitz et al., 2007). As such, examining maternal depression from a longitudinal dataset should provide a more complete story of maternal mental health.

PRAMS surveys in 2012, 2013, and 2014 included a total sample of 3,450 women, resulting in a weighted sample of 33,073. CUBS surveys in 2015, 2016, and 2017 included a total sample of 1,605 women, resulting in a weighted sample of 32,468 women. Combining the data from PRAMS 2012-2014 and CUBS 2015-2017 results in a

sample of 1,605 unique women representing 32,468 women who delivered a live birth during 2012-2014 in Alaska.

3.1.1 Dependent, Outcome Variable: Symptoms of Maternal Depression

The outcome measure of this research is symptoms of maternal depression (SMD), conceptualized in two novel ways. Both methods of conceptualizing the dependent variable are novel in that they take a longer-range perspective of maternal depression beyond the initial postpartum period to three years after birth.

In my first set of analyses, I examine SMD as a binary variable derived from two questions in the PRAMS survey and two questions in the CUBS survey. The PRAMS mental health module includes the following two questions:

> PRAMS Q67: *Since your new baby was born,* how often have you felt down, depressed, or hopeless?
>
> - Always
> - Often
> - Sometimes
> - Rarely
> - Never

> PRAMS Q68: *Since your new baby was born,* how often have you had little interest or little pleasure in doing things?
>
> - Always
> - Often
> - Sometimes
> - Rarely
> - Never

Mothers answering "Always" or "Often" to either question or "Sometimes" to both questions in PRAMS were classified as having experienced SMD (Blabey et al., 2009). These two questions from PRAMS related to depressed mood and lack of interest in doing things have been recommended as a depression case-finding instrument because of

their high sensitivity (96%) (Berg, 2002; Whooley, Avins, Miranda, Browner, 1997). The American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders (DSM),* describes symptoms and criteria for the diagnosis of mental disorders and is considered the authoritative guide for healthcare professionals. *DSM* has been periodically reviewed and revised since it was first published in 1952; the most up to date version is *DSM-5*. According to *DSM-5,* the criteria for depression includes either the presence of feelings of depression or hopelessness or a lack of interest or pleasure in doing things (anhedonia).

The CUBS survey, a follow-up to PRAMS three years later, asks about depressive symptoms during the previous 3 months, using questions similar to those on PRAMS:

> CUBS Q57: *During the past 3 months,* how often have you felt down, depressed or hopeless?
>
> - Always
> - Often
> - Sometimes
> - Rarely
> - Never

> CUBS Q58: *During the past 3 months,* how often have you had little interest or little pleasure in doing things you usually enjoyed?
>
> - Always
> - Often
> - Sometimes
> - Rarely
> - Never

Similarly, mothers answering "Always" or "Often" to either question or "Sometimes" to both questions in CUBS were classified as having experienced symptoms of maternal depression.

With the binary SMD variable, I combine all those who had been depressed at any point in time over the 3-year postpartum period (during completion of PRAMS only, CUBS

only, or both PRAMS and CUBS). With the binary SMD variable, women were classified as having SMD or not having SMD.

In my second set of analyses, I examine SMD as a nominal outcome with four possible values: absent (reference group), resolved, persistent, and incident SMD. Resolved SMD is defined as self-reported depressive symptoms in PRAMS only, during the immediate postpartum period. Persistent SMD is defined as self-reported depressive symptoms during both the immediate postpartum period in PRAMS and 3 years later in CUBS. Incident SMD is defined as self-reported depressive symptoms in CUBS only, at three years after childbirth. In other words, women with persistent SMD answered that they (1) always or often felt down, depressed, and hopeless, after giving birth and also at the 3- year follow-up; (2) always or often felt little interest or little pleasure in doing things, after giving birth and also at the 3- year follow-up; or (3) sometimes felt down, depressed, and hopeless, and sometimes felt little interest or little pleasure in doing things, after birth and also at the 3-year follow-up. Women with resolved SMD had symptoms only during the postpartum period (when completing PRAMS), and not during the 3-year follow-up. Blabey et. al (2009) and McLaughlin et. al (2009) from the Alaska Department of Health and Social Services have used this same definition of resolved and persistent SMD in the past.

Table 5 shows how these four survey questions were used to determine symptoms of maternal depression.

Table 5. Operationalizing the outcome variable: symptoms of maternal depression (SMD)

		Anhedonia (PRAMS Q68 and CUBS Q58)					
		Always	Often	Sometimes	Rarely	Never	Blank
Depressed Mood (PRAMS Q67 and CUBS Q57)	Always						
	Often						
	Sometimes						
	Rarely						
	Never						
	Blank						

Symptoms of maternal depression (SMD): Resolved (only at PRAMS); Persistent (at PRAMS and CUBS); Incident (only at CUBS)

Absent SMD

While the nominal SMD outcome pinpoints at what time and the duration of depressive symptoms among mothers, the binary SMD outcome provides an overall perspective of maternal depression. Both methods of conceptualizing the dependent variable are novel in that they take a longer-range perspective of maternal depression beyond the initial postpartum period to three years after birth.

3.1.2 Independent, Predictor Variables

I examine a variety of predictors from both PRAMS and CUBS, including sociodemographic characteristics, perinatal health, and psychosocial factors. These factors were identified through literature review or because I hypothesized a reasonable association between the variable and maternal depression. Sociodemographic variables include maternal race/ethnicity, age, education, income, use of Medicaid for health insurance, prenatal participation in the Women, Infants and Children's Program (WIC), marital status, and rural/urban residence at time of birth. Data for many of the

sociodemographic variables were derived from the child's birth certificate or PRAMS. Perinatal health factors include having depression before pregnancy, number of prenatal care visits, timing of first prenatal care visit, parity, alcohol use during pregnancy, tobacco use during pregnancy, admission of newborn in the neonatal intensive care unit, and breastfeeding. Psychosocial variables include intendedness of pregnancy, stressful life events at postpartum and 3 years later, physical abuse at postpartum and 3 years later, having a controlling partner at postpartum and 3 years later, and having social support. I describe how these measures are defined and operationalized below. In general, I use the methods recommended by CDC or the Alaska Division of Public Health or adopt approaches of other studies analyzing PRAMS data.

Sociodemographic Characteristics

Race/ethnicity. For ethnicity, women were classified as Hispanic or non-Hispanic based on self-report. Non-Hispanic women were classified as White or Asian/Pacific Islander. Alaskan Native women who were Hispanic or non-Hispanic were classified simply as Alaskan Native. Alaska Native refers to women who identify as Alaska Native or American Indian, either alone or in combination with other races. Due to the small sample size of Blacks ($n < 30$ unweighted), Blacks were combined with the "Other/Mixed" category.

Age. Maternal age at childbirth was obtained from birth certificate data and categorized into the four groups: 19 years and under, 20-24 years, 25-34 years, and 35 years and older.

Education. Education level of the mother was obtained from birth certificate data and recoded into four categories: less than 12 years, 12 years, 13-15 years, and 16 or more years.

Income. In PRAMS, women were asked, "During the *12 months before* your new baby was born, what was your yearly total household income before taxes?" Income categories include: Less than $18,000; $18,001 to $37,000; $37,001 to $69,000; $69,001 to $98,000; and $98,001 or more.

Medicaid. In PRAMS, women were asked what kind of health insurance they had to pay for prenatal care. I examine those who selected that they had Medicaid or Denali KidCare (Alaska's Medicaid program).

WIC. In PRAMS, women were asked whether they were on WIC, the Special Supplemental Nutrition Program for Women, Infants, and Children.

Marital Status. Marital status was obtained from birth certificate data. Women were classified as "married" or "unmarried."

Rural/urban residence. Classification of rural or urban residence was derived from birth certificate data. Alaska is the largest state geographically, and about one-third of the population lives in rural or remote areas (United States Department of Agriculture Economic Research Service, 2020).

Perinatal Health Characteristics

History of depression. In PRAMS, mothers are asked to respond yes or no to the question, "Before you got pregnant with your new baby, did a doctor, nurse, or other health care worker tell you that you had depression?"

Timing of first prenatal care visit. In PRAMS, mothers are asked, "How many weeks or months pregnant were you when you had your first visit for prenatal care?" Women provided their response in weeks or months, or indicated that they did not go for prenatal care. Responses were grouped according to the typical pregnancy trimester: first trimester is week 1-12 (or month 1-3), second trimester is week 13-26 (or month 4-6), and third trimester is week 27 – 40 (or month 7-9).

Parity. The number of previous live births a woman has had was obtained from birth certificate data. Women who had no previous live births were considered first-time mothers and women who had at least one previous live birth were not first-time mothers.

Alcohol use during pregnancy. In PRAMS, women are asked, "During the last 3 months of your pregnancy, how many alcoholic drinks did you have in an average week? Responses were dichotomized into "did not drink alcohol during pregnancy" and "drank alcohol during pregnancy" (1 drink or more a week).

Tobacco use during pregnancy. In PRAMS, women are asked, "During the last 3 months of your pregnancy, how many cigarettes did you smoke on an average day?" Responses were dichotomized into "did not smoke during pregnancy" and "smoked during pregnancy" (1 cigarette or more a day).

Breastfeeding. In PRAMS, women were asked to respond yes or no to the question, "Did you ever breastfeed or pump breast milk to feed your new baby, even for a short period of time?"

NICU. From PRAMS, women were asked to respond yes or no to the question, "After your baby was delivered, was he or she put in an intensive care unit (NICU)?"

Home visiting services. In PRAMS, women were asked, "During your most recent

pregnancy, did a home visitor come to your home to help you prepare for your new baby?" and "Since your new baby was born, has a home visitor come to your home to help you learn how to take care of yourself or your new baby?" Women responding yes to either or both questions were classified as having had home visiting services.

Psychosocial Risk Factors

Pregnancy intendedness. Pregnancy intendedness was measured using responses to the question, "Thinking back to just before you got pregnant with your new baby, how did you feel about becoming pregnant?" Women who reported either "I wanted to be pregnant sooner" or "I wanted to be pregnant then" were considered to have intended pregnancies. Women who reported either "I wanted to be pregnant later," "I didn't want to be pregnant then or at any time in the future," or "I wasn't sure what I wanted" were considered to have unintended pregnancies.

Stressful life events. Data for stressful life events came from both PRAMS and CUBS and are included in analysis as two distinct variables, one for the postpartum period (from PRAMS), and one for 3 years postpartum (from CUBS). The number of life stressors experienced by the mother in the year before the child was born and also at 3 years postpartum included a list of 13 events: close family member was very sick and went to the hospital; separation or divorce from husband/partner; moved to a new address; was homeless; husband/partner lost job; she lost her job; argued with husband/partner more than usual; husband/partner said he didn't want her to be pregnant; a lot of bills she couldn't pay; in a physical fight; husband/partner or she went to jail; someone close to her had a bad problem with drinking or drugs; someone close to her

died. These events were counted and categorized into the following: 0, 1-2 stressors, 3-5 stressors, and 6 or more stressors.

Experiencing physical abuse: Data for physical abuse came from both PRAMS and CUBS and are included in analysis as two distinct variables, one for the postpartum period (from PRAMS), and one for 3 years postpartum (from CUBS). For the postpartum period, this was defined as answering yes to either one of the two PRAMS questions, "During the *12 months before you got pregnant*, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any other way?" or "During *your most recent pregnancy*, did your husband or partner push, hit, slap, kick, choke, or physically hurt you in any other way? For the 3-year postpartum period, this was defined as answering yes to the question on CUBS, "During the past 12 months, did your husband or partner push, hit, slap, kick choke, or physically hurt you in any other way?"

Controlling partner: Data for having a controlling partner came from both PRAMS and CUBS and are included in analysis as two distinct variables, one for the postpartum period (from PRAMS), and one for 3 years postpartum (from CUBS). Having a controlling partner was defined as answering yes to the following question at any of the three time periods specified in PRAMS, "*During the last 12 months before I got pregnant, During my most recent pregnancy, Since my new baby was born*, did your husband or partner threaten you, limit your activities against your will, or make you feel unsafe in any other way?" For the 3-year postpartum variable, this was defined as answering yes to the CUBS question, "During the past 12 months, did your husband or partner threaten you, limit your activities against your will or make you feel unsafe in any other way?"

Social support. Social support was measured based on whether women answered yes or no to the following four questions: "I know someone who would…(1) loan me money for bills if I needed it; (2) help me if I was sick and needed to be in bed; (3) take me to the clinic or doctor's office if I needed a ride; and (4) listen to me if I needed to talk." Women answering no to all four questions were considered to have no support; women answering yes to all four questions were considered to have support.

3.1.3 Statistical Analysis

Statistical analyses were conducted using R statistical software version 3.6.3. To account for the stratified and weighted samples, the data was analyzed using the "survey" package of R (Lumley, 2020a). Multinomial regressions with the survey data were analyzed using the "svyVGAM" package in R (Lumley, 2020b). The data presented here were weighted to represent all women delivering live births in Alaska during the study periods, which should assist with providing comprehensive information to policymakers about the scope and nature of maternal depression.

First, I examined frequency distributions of the independent variables and describe the study population according to sociodemographic, perinatal health, and psychosocial characteristics. Second, I conducted bivariate logistic regressions to estimate the crude association between each independent variable and SMD. I estimated the unadjusted odds ratios (OR) and 95% confidence intervals (CI) using logistic regression for the binary SMD outcome and multinomial regression for categorical SMD outcome (no, resolved, persistent, and incident SMD). For ease of interpretation, I present odds ratios to show the proportional change in the probability that SMD occurs for each additional unit of the independent variable, all else equal. Factors with values greater than

one indicate that the odds are increased.

Third, I use hierarchical regression to build a total of five successive multiple regression models by sequentially adding groups of predictors to the model and incrementally examining the variables' direct and indirect effects on the binary SMD outcome. One of the limitations of the bivariate analyses is the odds ratios are unadjusted, meaning that they compare information across groups without taking into account the influence of other characteristics that may also be related to the differences. Multiple regressions provide more accurate estimates (adjusted odds ratios) of the impact of the independent variables by subtracting out the effects of the other independent variables. The multiple regression analyses provide information on whether group differences persist after controlling for specific sociodemographic, perinatal health, and psychosocial characteristics. By building the series models with select variables, I try to better understand how related variables work together to affect SMD. I add variables based on the literature and my hypotheses of relationships between the independent variables themselves and SMD. Adding variables and comparing estimates to the first model, I gauge the extent to which these variables could explain differences in maternal depression.

As shown in Table 6., in Model 1a, I examine a subset of sociodemographics and measure adjusted effects of age, race, education, and rurality on the likelihood of SMD. These are basic sociodemographics to compare women of the same age, race, education, and rurality and their risk of SMD. In Model 1b, I add income, marital status, and specific maternal health characteristics of women *before pregnancy*, including pregnancy intention, history of depression, and parity, to understand their association with SMD,

after controlling for age, race, education, and rurality. In addition to the variables from Models 1a and 1b, Model 2 adds maternal health, and psychosocial characteristics of women *during pregnancy*. Model 3 adds infant delivery and psychosocial characteristics *after pregnancy*. Finally, Model 4 is the full model of all sociodemographic, maternal health, and psychosocial variables. Model 4 includes Medicaid, WIC, and home visiting services, which have been included in the final model because they are government programs intended to respond to needs of mothers. I am interested in how Medicaid, WIC, and home visiting may serve as part of the potential solution for addressing SMD.

Sampling weights were used to account for PRAMS' complex sampling design. A p value < 0.05 was considered statistically significant, and 95% confidence intervals (CIs) were used to assess the statistical significance of estimated odds ratios.

Table 6. Description of hierarchal regression models of SMD

Model	Probability of SMD as a function of:	Purpose
Model 1a: Sociodemographics	age + race + education + rural	Understand the relationship between age, race, education, and rurality on SMD
Model 1b: Sociodemographics and preconception health characteristics, *before pregnancy*	age + race + education + rural + income + marital status + pregnancy intention + history of depression + parity	Understand the relationships between income, marital status, pregnancy intention, history of depression, and parity on SMD, after controlling for initial sociodemographic factors in Model 1a. As a set, these variables describe women *before pregnancy.*
Model 2: Sociodemographics, perinatal health, and psychosocial characteristics, *during pregnancy*	age + race + education + rural + income + marital status + pregnancy intention + history of depression + parity + prenatal care + alcohol + tobacco + stressful life events + abuse + controlling partner	Understand the relationships between maternal health and psychosocial variables and SMD, after controlling for variables from Models 1a and 1b. As a set, these variables describe women and their experiences *during pregnancy.*
Model 3: Sociodemographics, perinatal health, and psychosocial characteristics *after pregnancy*	age + race + income + education + marital status + rural + depression + parity + prenatal care + alcohol + tobacco + stressful life events + abuse + control + NICU + breastfeeding + abuse at 3 years postpartum + controlling partner + controlling partner 3 years postpartum + stressful life events 3 years postpartum + social support	Understand the relationship between infant delivery and psychosocial variables and SMD, after controlling for variables from Models 1a, 1b, and 2. As a set, these variables describe women and their experiences *after pregnancy*.
Full Model: Sociodemographics, perinatal health, and psychosocial characteristics *with programs responding to needs*	age + race + income + education + marital status + rural + depression + prenatal care + parity + alcohol + tobacco + stressful life events + abuse + abuse at 3 years postpartum + controlling partner + controlling partner 3 years postpartum + NICU + breastfeeding + stressful live events 3 years postpartum + social support + Medicaid + WIC + home visiting	Full model to examine all predictor variables and their relationship with SMD. Medicaid, WIC, and home visiting services are included in this final model because they are public programs responding to the needs of women and families.

Notes: Reference is Absent SMD (SMD = 0).

Multiple logistic regression

SMD = 1, reported depression at postpartum and/or 3 years later (including any resolved, persistent, and incident SMD)

Multiple multinomial regression

SMD = 2, resolved SMD (reported SMD during postpartum period)

SMD = 3, persistent SMD (reported SMD during both postpartum period and 3 years later)

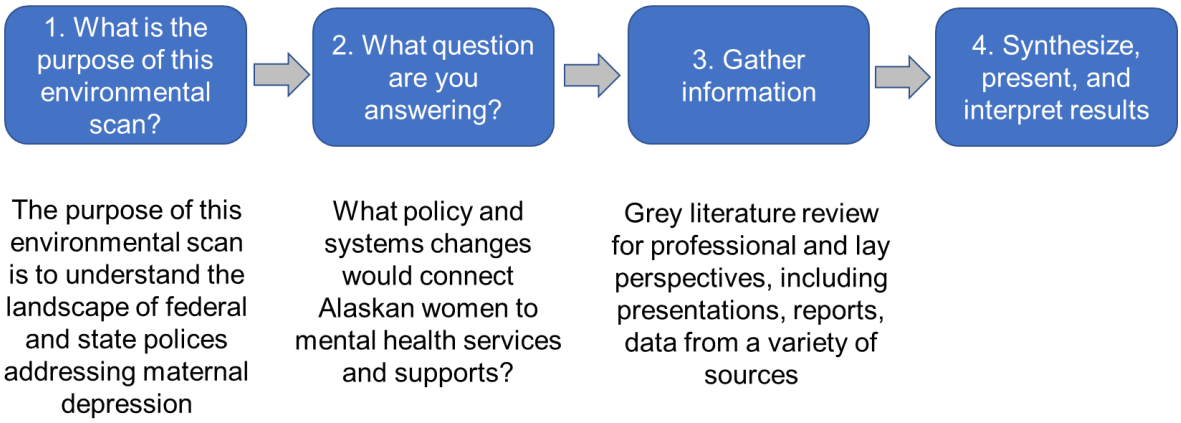
SMD = 4, incident SMD (reported SMD at 3-year follow-up only)

3.2 Qualitative Data: Environmental Scan

In combination with the quantitative data to understand the nature and scope of maternal depression in Alaska, I conduct an environmental scan to understand the landscape of policies addressing maternal depression. The definition and methods of an environmental scan varies according to the context in which it is used (Shahid & Turin, 2018), but here I use it to assess the policy environment around maternal depression. Environmental scans have been described as an important and effective tool to inform policymaking and program development (Charlton et al., 2019; Graham, Evitts, & Thomas-MacLean, 2008; Rowel, Moore, Nowrojee, Memiah, & Bronner, 2005). Identifying potential threats, opportunities and lessons learned from others, and emerging issues in the social, political, technological and economic environments is important for planning and policymaking (Rowel et al., 2005). Environmental scans have been used as an approach to gathering information a variety of purposes: reviewing the current state of services and programs, evaluating community needs, identifying service gaps, assessing professional education and training needs, supporting quality improvement initiatives, and informing program and policy development (Charlton et al., 2019).

An environmental scan differs from the conventional literature review in that it examines grey literature and publicly available program information, including theoretical models, planning frameworks, policies, and consultations or interviews with experts. Figure 2 from Shahid & Turin (2018) provides an overall picture of the flexible steps I take in this environmental scan.

Figure 2. Bird's eye view of the environmental scan process (adapted from Shahid & Turin, 2018).



I review grey literature and documents from existing federal guidance, state legislations, policy syntheses, presentations, reports, and data from government agencies, universities, state mental health coalitions and collaboratives, research organizations, professional health organizations, and nonprofit and philanthropic organizations. I conduct targeted Web searches on the U.S. Department of Health and Human Services website and targeted Google searches using the terms "maternal depression, maternal depression, postpartum depression" and "state policy," "Medicaid," and "Affordable Care Act." Sources include the U.S. Department of Health and Human Services (Substance Abuse and Health Services Administration, Health Resources and Services Administration, National Institute of Mental Health, Office of Women's Health, Centers for Disease Control and Prevention), The National Academies of Sciences, National Conference of State Legislatures, Center for Law and Social Policy, KFF (Kaiser Family Foundation), The Kresge Foundation, The Robert Wood Johnson Foundation, ZERO TO THREE, and others. I reviewed cited references of reviewed documents to identify

additional sources. I use this environmental scan about national and state policies addressing maternal depression to synthesize information about policy tools for Alaska to consider.

3.3 Ethical Review

This study has been determined by the Institutional Review Board (IRB) at Georgia State University to be exempt from federal regulations as defined in 45 CFR 46 and also determined to meet the organization's ethical standards. (See Appendix A for the letter of exemption provided by the IRB.)

CHAPTER 4: RESULTS

In this chapter, I first describe the sample of respondents from the Alaska PRAMS 2012-2014 and CUBS 2015-2017 survey data. I then present results from statistical analyses of the organized by primary research questions. I present the adjusted odds ratios from five successive multiple regression models examining sociodemographic, perinatal health, and psychosocial variables' direct and indirect effects on SMD. Lastly, I answer my final research question about policy and systems changes for connecting women to mental health services. I describe my findings from an environmental scan and present policy options that incorporate what I have learned about the scope, nature, and context of maternal depression in Alaska.

4.1 Sample Characteristics

Tables 7-9 show the sociodemographic, perinatal health, and psychosocial characteristics of survey participants who give birth in Alaska in 2012-2014 (total weighted N=32,468). Over half (58%) of women were 25-34 years old, and about one-quarter (22%) were 20-24 years. Over half (56%) of women were non-Hispanic White, 21% were Alaskan Native, 7% were Asian/Pacific Islander, 4% were Hispanic, and 12% identified as other/mixed race (including Black, which was included in the "other/mixed race" category due to small sample size). Nineteen percent had a household income of less than $18,000, and 21% had a household income of more than $98,000. Two-third (66%) of the mothers were married, and 72% lived in urban areas. About 8% of women in the sample indicated that they had depression before they were pregnant. While 81% of women in the sample initiated prenatal care within their first trimester, 15% said they initiated care in their second trimester or later. Forty percent of women were first-time

mothers. About 5% said they use alcohol during pregnancy, and 12% said they used tobacco during pregnancy.

About 15% indicated that they had a home visitor (e.g., nurse, health care worker, social worker) come to their home to help with their pregnancy and/or new baby. Over half of the pregnancies were intended. Forty-five percent of mothers said they experienced 1-2 stressful life events during their pregnancy, and 43% said they experienced 1-2 stressful events since their child was born (at the 3-year follow-up CUBS). About 3-4% said that they experienced some type of intimate partner violence (physical abuse or having a controlling partner) during their pregnancy or in the 3 years since the birth of their child. Three-quarters (75%) said they had social support.

Table 7. Sociodemographic characteristics of women, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (total weighted N=32,468)

	N	%
Age		
19 years and under	2,556	7.9
20 - 24 years	7,209	22.2
25 - 34 years	18,686	57.6
35 years and older	4,017	12.4
Race/ethnicity		
White	18,321	56.4
Alaskan Native	6,723	20.7
Asian/Pacific Islander	2,241	6.9
Hispanic	1,427	4.4
Other/Mixed	3,757	11.6
Education		
Less than 12 years	3,406	10.5
12 years	10,310	31.8
13-15 years	8,698	26.8
More than 16 years	9,513	29.3
Missing/unknown	542	1.7
Income		
Less than $18,000	6,039	18.6
$18,001 to $37,000	6,560	20.2
$37,001 to $69,000	6,593	20.3
$69,001 to $98,000	4,548	14.0
$98,001 or more	6,665	20.5
Missing/unknown	2,064	6.4
Medicaid Beneficiary		
No	17,822	54.9
Yes	14,281	44.0
Missing/unknown	365	1.1
WIC Recipient		
No	19,719	60.7
Yes	12,639	38.9
Missing/unknown	110	0.3
Marital Status		
Married	21,502	66.2
Unmarried	10,966	33.8
Rural/urban		
Rural	9,237	28.4
Urban	23,231	71.6

Table 8. Perinatal health of women, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (total weighted N=32,468)

	N	%
History of depression		
No	29,370	90.5
Yes	2,526	7.8
Missing/unknown	572	1.8
Timing of first prenatal care visit		
1st trimester	26,432	81.4
2nd trimester or later	6,292	15.0
Missing/unknown	1,185	3.6
Parity		
0, First-time mom	13,006	40.1
≥1, Not a first-time mom	19,097	58.8
Missing/unknown	365	1.1
Alcohol use during pregnancy		
No	30,500	93.9
Yes	1,735	5.3
Missing/unknown	233	0.7
Tobacco use during pregnancy		
No	28,277	87.1
Yes	3,895	12.0
Missing/unknown	296	0.9
NICU admission		
No	28,782	88.6
Yes	3,142	9.7
Missing/unknown	544	1.7
Home visitor services		
No	27,865	85.8
Yes	4,728	14.6
Missing/unknown	476	1.5
Breastfeeding (ever)		
No	1,505	4.6
Yes	30,676	94.5
Missing/unknown	287	0.9

Table 9. Psychosocial characteristics of women, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (total weighted N=32,468)

	N	%
Intendedness of pregnancy		
Unintended	13,459	41.5
Intended	18,492	57.0
Missing/unknown	517	1.6
Stressful life events		
None	8,943	27.5
1-2 stressors	14,838	45.7
3-5 stressors	7,176	22.1
6 or more stressors	1,393	4.3
Missing/unknown	118	0.4
Stressful life events, 3 years later		
None	9,480	29.2
1-2 stressors	13,992	43.1
3-5 stressors	7,156	22.0
6 or more stressors	1,574	4.8
Missing/unknown	266	0.8
Any abuse		
No	30,175	92.9
Yes	1,399	4.3
Missing/unknown	894	2.8
Any abuse, 3 years later		
No	30,554	94.1
Yes	1,350	4.2
Missing/unknown	564	1.7
Physical abuse		
No	31,305	96.4
Yes	874	2.7
Missing/unknown	289	0.9
Physical abuse, 3 years later		
No	30,988	95.4
Yes	834	2.6
Missing/unknown	646	2.0
Controlling partner		
No	30,751	94.7
Yes	964	3.0
Missing/unknown	753	2.3
Controlling partner, 3 years later		
No	30,722	94.6
Yes	1,159	3.6
Missing/unknown	588	1.8
Social support		
No	8,258	25.4
Yes	24,211	74.6

4.2 What is the prevalence of symptoms of maternal depression among women in Alaska who delivered between 2012 and 2014?

Tables 10 provides the crosstabulation of responses to the two PRAMS questions used to create the first half of the outcome of interest, symptoms of maternal depression. When asked how often they felt down, depressed or hopeless since the birth of their baby, 3.6% said always or often, and 22.1% said sometimes. When asked how often they have had little interest or little pleasure in doing things since the birth of their baby, 8.2% said always or often, and 17.2% said sometimes.

Table 10. Cross-tabulation of responses to the PRAMS anhedonia and depressed mood items used to determine cohort of women with symptoms of maternal depression during the postpartum period (cell percentages) (weighted N=32,468)

		Percentage Reporting Anhedonia (PRAMS Q68)						
		Always	Often	Sometimes	Rarely	Never	Blank	TOTAL
Percentage Reporting Depressed Mood (PRAMS Q67)	Always	0.2	0.0	0.2	0.0	0.0	0.0	0.5
	Often	0.0	1.3	1.5	0.1	0.2	0.0	3.1
	Sometimes	0.1	2.5	9.2	7.8	2.4	0.2	22.1
	Rarely	0.8	1.6	4.5	17.6	13.3	0.0	37.9
	Never	1.1	0.4	1.8	6.0	25.7	0.5	35.4
	Blank	0.0	0.1	0.0	0.2	0.2	0.5	1.0
	TOTAL	2.2	6.0	17.2	31.8	41.7	1.2	100.0

Symptoms of maternal depression (SMD) during postpartum period in PRAMS, total of 19.3%

No SMD during postpartum period

Those who have symptoms of depression are mothers who responded “always” or “often” to the depressed mood question and anhedonia question, or “sometimes” to both

questions. Given this, among women who delivered between 2012 and 2014 in Alaska, 19.3% had symptoms of maternal depression (Table 11).

Table 11. Postpartum symptoms of maternal depression among Alaska women who gave birth in 2012-2014

	Weighted N	***%***
No postpartum SMD	26,204	80.7
Had postpartum SMD	6,264	19.3

Table 12 provides the crosstabulation of responses to the two CUBS questions used to create the second half of the SMD outcome. When asked how often they felt down, depressed or hopeless since the birth of their baby, 3.6% said always or often, and 22.1% said sometimes. When asked how often they have had little interest or little pleasure in doing things since the birth of their baby, 8.2% said always or often, and 17.2% said sometimes.

Table 12. Cross-tabulation of responses to CUBS anhedonia and depressed mood items (cell percentages) (weighted N=32,468)

		Percentage Reporting Anhedonia (CUBS Q58)						
		Always	Often	Sometimes	Rarely	Never	Blank	TOTAL
Percentage Reporting Depressed Mood (CUBS Q57)	Always	0.4	0.1	0.1	0.3	0.0	0.0	0.8
	Often	0.3	2.2	1.8	0.5	0.1	0.0	4.9
	Sometimes	0.0	1.5	10.1	8.6	2.8	0.0	23.1
	Rarely	0.1	0.4	3.1	19.7	13.9	0.0	37.2
	Never	0.5	0.2	1.3	4.1	26.2	0.2	32.5
	Blank	0.0	0.0	0.1	0.0	0.3	1.1	1.5
	TOTAL	1.2	4.4	16.4	33.3	43.4	1.3	100

Symptoms of maternal depression (SMD) during the 3-year follow-up in CUBS, total of 18.5%

No SMD during the 3-year follow-up

Those who have SMD at the 3-year follow-up are mothers who responded "always" or "often" to the depressed mood question and anhedonia question, or "sometimes" to both questions. Given this, 18.5% of women had symptoms of depression at 3 years postpartum (Table 13).

Table 13. Symptoms of maternal depression at 3 years postpartum among Alaska women who gave birth in 2012-2014

	Weighted N	***%***
No SMD at 3 years postpartum	26,475	81.5
Had SMD at 3 years postpartum	5,993	18.5

To summarize, among women who delivered a baby between 2012 and 2014 in Alaska, 19.3% reported symptoms of maternal depression 2 to 6 months after delivery. Three years later, 18.5% of the women in this cohort reported symptoms of depression.

4.2.1 How many women reporting postpartum symptoms of maternal depression continue to report symptoms of depression at three years postpartum?

Combining the data from both PRAMS and CUBS, I created a cohort of women to examine SMD during the postpartum period and at 3 years postpartum. Table 14 displays the distribution of women with absent, resolved, persistent, and incident SMD. Sixty-nine percent of women surveyed at both PRAMS and CUBS reported no SMD at either time period; 12% reported resolved SMD, experiencing symptoms at postpartum only and no symptoms three years later; 7% had persistent SMD, experiencing symptoms postpartum and at 3-year follow-up; and 11% reported incident SMD, experiencing symptoms at the three-year follow-up only.

Table 14. Cross-tabulation of women with symptoms of maternal depression at postpartum and at 3 years postpartum, from Alaska PRAMS 2012-2014 and CUBS 2015-2017

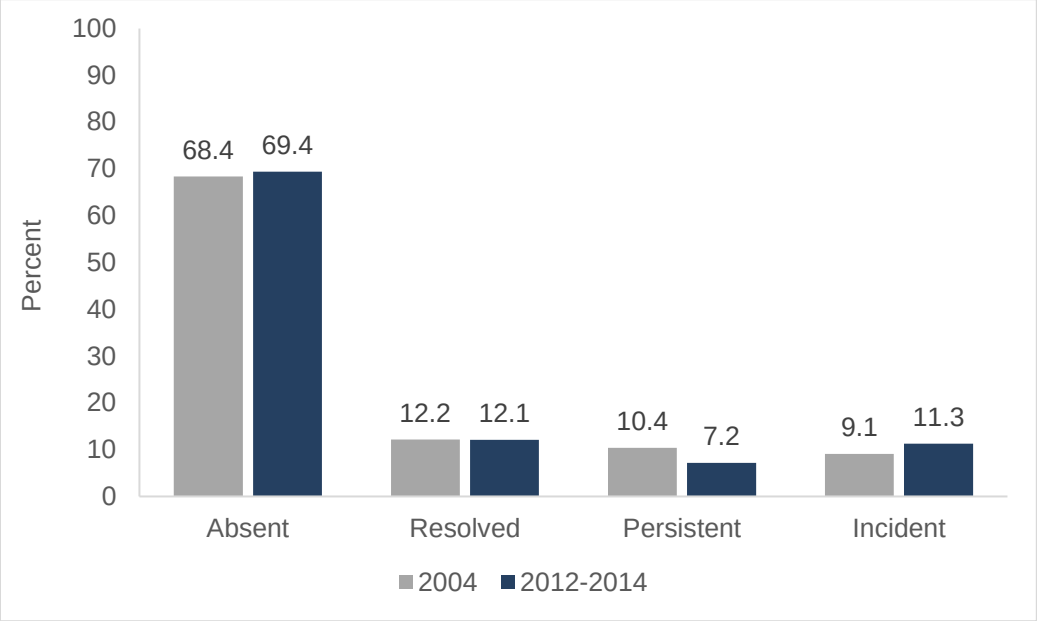
Postpartum symptoms of maternal depression (PRAMS)		Symptoms of maternal depression at 3 years postpartum (CUBS)	
		No	Yes
	No	69.4% (*absent SMD)*	11.3% *(incident SMD)*
	Yes	12.1% *(resolved SMD)*	7.2% *(persistent SMD)*

During 2012-2014, a weighted total of 6,570 women (19.3%) responding to PRAMS reported SMD. During 2015-2017, a weighted total of 5,993 women (18.5%) responding to CUBS reported SMD. Among the women who reported postpartum SMD in 2012-2014, 35.6% (2,336/6,570) reported SMD three years later.

In 2009, the State of Alaska Maternal and Child Health Epidemiology Unit conducted its first and only analysis of SMD using PRAMS and CUBS data from a cohort of mothers who delivered in 2004 (McLaughlin et al., 2009). The results from the 2004 baseline analysis serves as a point for comparison for my current study.

In 2004, 68.4% of women who delivered a live-born infant in Alaska reported no symptoms of maternal depression, compared to the 69.4% in 2012-2014. In 2004, 12.2% of women reported resolved SMD, compared to 12.1% in 2012-2014; 10.4% reported persistent SMD in 2004, compared to 7.2% in 2012-2014. The prevalence of self-reported postpartum SMD in Alaska has been stable over time and the figures for 2012-2014 are similar to the prevalence reported in 2004 (Figure 3).

Figure 3. Percent of women that delivered a live-born infant in Alaska who reported absent, resolved, persistent, and incident symptoms of maternal depression: 2004 vs. 2012-2014.



Note: Data for 2004 are derived from the State of *Alaska Epidemiology Bulletin, Maternal Mental Health* in Alaska, July 2, 2009.

Tables 15-17 show the proportion of women reporting SMD, including resolved, persistent, and incident SMD, by sociodemographic, perinatal health, and psychosocial characteristics. Of note, 48% of Asian/Pacific Islander women in Alaska reported SMD, and 16% had persistent SMD. Thirty-nine percent of Hispanic women in Alaska reported SMD, including 28.3% who had incident SMD. Nearly half (48%) of mothers with a household income of less than $18,000 reported SMD. Forty-one percent of unmarried mothers reported SMD. Fifty-eight percent of women with depression before pregnancy reported SMD, with 24% reporting persistent SMD. Nearly half (48%) of mothers who never initiated breastfeeding reported SMD. Sixty-two percent of women who had 6 or more stressful life events during their pregnancy reported SMD, with 26% having persistent SMD; 59% of those who had 6 more stressful life events in the 3 years after

their child was born reported SMD, with 29% reporting persistent SMD. Fifty-seven percent of women who reported physical abuse from a partner during their pregnancy reported SMD, with 24% reporting resolved SMD and 26% reporting incident SMD. Forty-eight percent of women with a controlling partner during pregnancy reported SMD, with 26% reporting that resolved SMD. Forty-five percent of women without social support reported SMD.

Table 15. Percentage of respondents with symptoms of maternal depression, by sociodemographic characteristics, Alaska PRAMS 2012-2014 and CUBS 2015-2017

	SMD	Type of SMD		
		Resolved	Persistent	Incident
Weighted Total	30.6	12.1	7.2	11.3
Age				
19 years and under	36.6	14.9	13.0	8.7
20 - 24 years	36.6	13.3	7.0	16.3
25 - 34 years	28.9	12.7	7.0	9.2
35 years and older	23.7	5.5	4.8	13.4
Race/ethnicity				
White	26.3	10.7	6.9	8.7
Alaskan Native	34.8	12.5	7.4	14.8
Asian/Pacific Islander	47.7	18.2	16.3	13.2
Hispanic	39.0	7.2	3.5	28.3
Other/Mixed	30.3	16.3	4.3	9.8
Education				
Less than 12 years	42.3	14.4	11.2	16.7
12 years	36.8	14.5	7.8	14.5
13-15 years	26.4	11.3	6.8	8.3
More than 16 years	23.5	9.3	5.8	8.5
Income				
Less than $18,000	46.7	18.5	10.3	17.8
$18,001 to $37,000	32.4	13.7	6.1	12.7
$37,001 to $69,000	29.4	8.8	9.1	11.5
$69,001 to $98,000	23.3	10.5	8.4	4.4
$98,001 or more	20.8	10.1	2.2	8.5
Medicaid beneficiary				
No	25.8	10.7	6.1	9.0
Yes	36.0	13.7	8.7	13.5
WIC recipient				
No	26.7	10.9	6.4	9.4
Yes	36.4	13.7	8.5	14.2
Marital status				
Married	25.3	10.5	6.5	8.2
Unmarried	40.9	15.2	8.5	17.3
Rural/urban				
Rural	32.7	12.1	7.2	13.3
Urban	29.7	12.1	7.2	10.4

Notes on types of SMD
Resolved SMD: reported depression during postpartum period
Persistent SMD: reported depression during both postpartum period and 3 years later
Incident SMD: reported depression at 3-year follow-up only
SMD: reported depression at postpartum and/or 3 years later (sum of resolved, persistent, and incident)

Table 16. Percentage of respondents with symptoms of maternal depression, by perinatal health characteristics, Alaska PRAMS 2012-2014 and CUBS 2015-2017

	SMD	Type of SMD		
		Resolved	Persistent	Incident
Weighted Total	30.6	12.1	7.2	11.3
Depression before pregnancy				
No	28.0	11.6	5.7	10.6
Yes	57.5	17.6	23.7	16.2
Timing of first prenatal care visit				
1st trimester	29.0	11.1	7.6	10.3
2nd trimester or later	52.8	26.1	8.2	18.5
Parity				
0, First-time mom	35.1	14.1	7.3	13.6
≥1, Not a first-time mom	27.4	10.6	7.0	9.9
Alcohol use during pregnancy				
No	30.2	11.8	7.1	11.4
Yes	36.1	18.8	9.5	7.8
Tobacco use during pregnancy				
No	29.6	11.1	6.9	11.6
Yes	37.5	18.3	9.9	9.3
NICU admission				
No	29.0	11.7	7.1	10.1
Yes	40.0	16.2	6.9	16.9
Home visitor services				
No	30.1	11.7	7.0	11.5
Yes	35.7	16.1	9.2	10.3
Breastfeeding (ever)				
No	48.1	22.1	3.0	23.0
Yes	29.6	11.5	7.5	10.7

Table 17. Percentage of respondents with symptoms of maternal depression, by psychosocial characteristics, Alaska PRAMS 2012-2014 and CUBS 2015-2017

	SMD	Type of SMD		
		Resolved	Persistent	Incident
Weighted Total	30.6	12.1	7.2	11.3
Pregnancy intendedness				
Unintended	35.2	13.8	7.5	13.8
Intended	27.0	11.0	6.6	9.4
Stressful life events				
None	24.0	10.4	5.1	8.5
1-2 stressors	27.6	11.0	5.4	11.2
3-5 stressors	38.9	15.0	10.0	13.9
6 or more stressors	61.7	21.0	25.9	14.9
Stressful life events, 3 years later				
None	22.7	8.4	5.7	8.6
1-2 stressors	27.4	13.1	5.6	8.7
3-5 stressors	41.0	13.0	11.6	16.4
6 or more stressors	59.3	18.8	11.9	28.7
Physical abuse				
No	29.8	11.9	7.2	10.7
Yes	57.2	24.2	6.7	26.3
Physical abuse, 3 years later				
No	29.6	11.8	7.3	10.5
Yes	60.5	15.4	8.2	36.9
Controlling partner				
No	29.7	11.7	7.0	11.0
Yes	47.7	25.8	8.6	13.3
Controlling partner, 3 years later				
No	29.2	11.6	7.1	10.5
Yes	65.1	24.8	12.0	28.3
Social support				
No	45.3	17.2	11.1	17.0
Yes	25.5	10.4	5.8	9.3

4.3 What sociodemographic, perinatal health, and psychosocial factors are associated with symptoms of maternal depression among women in Alaska?

To answer this research question, I first present the unadjusted odds ratios from bivariate logistic regressions for the binary SMD outcome and multinomial regression for the nominal SMD outcome (resolved, persistent, and incident SMD). Odds ratios over 1 indicate an increase in the likelihood of being classified in the SMD outcome category and values less than 1 indicate a decrease in likelihood. I then present the adjusted odds ratios from five successive multiple regression models examining sociodemographic, perinatal health, and psychosocial variables' direct and indirect effects on SMD.

4.3.1 Bivariate Regressions

Sociodemographic Factors

Table 18 shows the unadjusted odds ratios between the sociodemographic characteristics and SMD. Sociodemographic variables found to be significantly associated with SMD among this sample of women in Alaska include age, race/ethnicity, education, income, Medicaid beneficiary, WIC recipient, and marital status. Women reporting symptoms of depression at any point in time in the three-year period after giving birth are more likely to be Asian/Pacific Islander; be younger, with more women in the 20-24 years old range; have less than a high school education; have lower household income (less than $18,000); be a Medicaid beneficiary; be a WIC recipient; and is unmarried. Results from the bivariate analyses show the following:

- **Younger mothers are more likely to report SMD**. Mothers aged 20-24 years had increased odds of SMD when compared to those aged 25-34 years (OR 1.42, 95% 1.01-1.99). In addition, mothers aged 20-24 had increased odds of reporting

SMD at 3 years postpartum (incident SMD). Teenage mothers (19 years and under) also had increased odds of SMD, though this was not significant.

- **Asian/Pacific Islander and Alaskan Native women were more likely to report SMD.** Compared to non-Hispanic White women, Asian/Pacific Islander women had 2.56 times greater odds of reporting SMD (95% CI 1.43-4.58) and 3.34 times (95% CI 1.38-8.12) greater odds of reporting persistent SMD. Alaskan Native women also had increased odds of SMD (OR 1.5, 95% CI 1.12-2.00) and increased odds of incident SMD (OR 1.9, 95% CI 1.26-2.96)
- **Women with less education are more likely to report SMD.** Compared to more educated women, women with less than a high school education had 2.39 times greater odds of reporting SMD (95% CI 1.47-3.87) and 2.58 times greater odds of reporting persistent SMD (95% CI 1.07-6.26). Women with a high school education (12 years) had 1.89 times greater odds of reporting SMD (95% CI 1.33-2.7) and 2.08 times greater odds of reporting SMD at 3 years postpartum (95% CI 1.23-3.5).
- **Low-income mothers are more likely to report SMD.** Compared to women who make over $98,000, those making less than $18,000 have 3.34 times greater odds of reporting SMD (95% CI 2.12-5.25) and 6.98 times more likely to report persistent SMD (95% CI 2.4-20.36). Women making between $18,001 to $69,000 also had increased odds of SMD. Income across all levels is associated with persistent SMD.
- **Medicaid beneficiaries are more likely to report SMD.** The odds of women with Medicaid reporting SMD are 1.62 times that of non-Medicaid beneficiaries.

Medicaid beneficiaries are also significantly more likely to report resolved SMD (OR = 1.49, 95% CI 1.02-2.23) and incident SMD (OR 1.75, 95% CI 1.16-2.65).

- **Mothers with WIC are more likely to report SMD**. The odds of women with WIC reporting SMD are 1.57 times greater than the odds of those without WIC (95% CI 1.19-2.08).
- **Unmarried mothers are more likely to report SMD.** The odds of an unmarried mother reporting SMD are 2.05 times that of married mother (95% CI 1.55-2.71). Unmarried mothers have 1.82 times greater odds of reporting resolved SMD (95% VCI 1.02-1.22) and 2.67 times more likely to have SMD 3 years later (incident SMD 95% CI 1.77-4.03).

Table 18. Bivariate logistic and multinomial regressions of sociodemographic characteristics and type of SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (unadjusted odds ratio)

	SMD		Type of SMD					
			Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age								
19 years and under	1.42	0.83 - 2.43	1.32	0.60 - 2.90	2.08	0.91 - 4.74	1.06	0.44 - 2.57
20 - 24 years	**1.42** *	1.01 - 1.99	1.17	0.74 - 1.86	1.13	0.58 - 2.17	**1.98** **	1.22 - 3.21
25 - 34 years	Ref		Ref		Ref		Ref	
35 years and older	0.76	0.49 - 1.19	0.41	0.19 - 0.90	0.64	0.31 - 1.33	1.35	0.74 - 2.48
Race/ethnicity								
White	Ref		Ref		Ref		Ref	
Alaskan Native	**1.50** **	1.12 - 2.00	1.32	0.87 - 2.01	1.22	0.72 - 2.07	**1.93** ***	1.26 - 2.96
Asian/Pacific Islander	**2.56** **	1.43 - 4.58	**2.39** **	1.07 - 5.35	**3.34** **	1.38 - 8.12	2.14	0.88 - 5.21
Hispanic	1.79	0.88 - 3.68	0.87	0.15 - 5.15	0.35	0.09 - 1.39	**4.18** ***	1.52 - 11.53
Other/Mixed	1.22	0.79 - 1.88	1.51	0.87 - 2.64	0.70	0.34 - 1.46	1.42	0.72 - 2.77
Education								
Less than 12 years	**2.39** ***	1.47 - 3.87	**2.05** *	1.00 - 4.22	**2.58** **	1.07 - 6.26	**2.62** ***	1.32 - 5.22
12 years	**1.89** ***	1.33 - 2.70	**1.89** *	1.12 - 3.17	1.63	0.86 - 3.11	**2.08** **	1.23 - 3.50
13-15 years	1.17	0.81 - 1.69	1.27	0.73 - 2.19	1.23	0.62 - 2.43	1.02	0.58 - 1.79
More than 16 years	Ref		Ref		Ref		Ref	
Income								
Less than $18,000	**3.34** ***	2.12 - 5.25	**2.72** **	1.43 - 5.18	**6.98** ***	2.40 - 20.36	**3.12** ***	1.66 - 5.86
$18,001 to $37,000	**1.83** *	1.15 - 2.91	1.58	0.82 - 3.06	**3.27** **	1.11 - 9.64	1.75	0.91 - 3.38
$37,001 to $69,000	**1.59** *	1.00 - 2.53	0.98	0.49 - 1.95	**4.68** *	1.63 - 13.46	1.52	0.78 - 2.94
$69,001 to $98,000	1.16	0.69 - 1.94	1.07	0.52 - 2.21	**3.94** **	1.26 - 12.31	0.53	0.23 - 1.23
$98,001 or more	Ref		Ref		Ref		Ref	
Medicaid beneficiary								
No	Ref		Ref		Ref		Ref	
Yes	**1.62** ***	1.22 - 2.14	**1.49** **	1.02 - 2.23	1.64	0.99 - 2.72	**1.75** **	1.16 - 2.65
WIC recipient								
No	Ref		Ref		Ref		Ref	
Yes	**1.57** **	1.19 - 2.08	1.45	0.97 - 2.17	1.53	0.92 - 2.55	**1.74** **	1.15 - 2.62
Marital status								
Married	Ref		Ref		Ref		Ref	
Unmarried	**2.05** ***	1.55 - 2.71	**1.82** ***	1.02 - 1.22	1.65	0.98 - 2.76	**2.67** ***	1.77 - 4.03
Rural/urban								
Rural	1.15	0.87 - 1.51	1.04	0.70 - 1.55	1.05	0.62 - 1.76	1.33	0.89 - 2.00
Urban	Ref		Ref		Ref		Ref	

** p < .05; ** p < .01; *** p < .001*

Perinatal Health

Table 19 shows the unadjusted odds ratios between perinatal health characteristics and SMD. Perinatal health variables found to be significantly associated with SMD among this sample of women in Alaska include history of depression, parity, tobacco use, NICU admission, home visitor services, and breastfeeding. Women reporting symptoms of depression at any point in time between postpartum and 3 years later were more likely to: have had depression before pregnancy; be first-time mothers; and not have ever initiated breastfeeding. Results from the bivariate analyses show the following:

- **History of depression.** Compared to those who did not have a history of depression, women who had a history of depression were 3.48 times more likely to have SMD (95% OR 2.12-5.70) and 7.01 times more likely to report persistent SMD (95% OR 3.71-13.27).
- **Timing of first prenatal care visit.** Compared to women who initiated prenatal care in their first trimester, women who initiated prenatal care in their second trimester or later 1.46 times more likely to report SMD (95% OR 1.05-2.05) and 1.72 times more likely to report incident SMD (95% OR 1.07-2.76).
- **Parity.** First-time mothers were 1.43 times more likely to report SMD than those who have had children before (95% OR 1.08-1.89). First-time mothers were also 1.55 times more likely to report incident SMD (95% OR 1.02-2.34).
- **Tobacco use during pregnancy.** Women who used smoked cigarettes during pregnancy were 1.85 times more likely to report that they had resolved SMD (SMD at the PRAMS survey but not at the CUBS survey).

- **NICU admission.** Mothers whose baby was in the NICU were 1.63 times more likely to report SMD than those who did not have a baby in the NICU (95% OR 1.09-2.44).
- **Home visitor services.** Mothers who received home visiting services were 1.48 times more likely to report SMD than those who did not receive home visiting services (95% OR 1.02-2.16).
- **Breastfeeding.** Mothers who did not ever breastfeed their babies were 2.2 times more likely to report SMD (95% OR 1.15-4.22). In other words, mothers who breastfed their babies were less likely to report SMD.

Table 19. Bivariate logistic and multinomial regressions of perinatal health characteristics and type of SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (unadjusted odds ratio)

	SMD			Type of SMD								
				Resolved			Persistent			Incident		
	OR		95% CI	OR		95% CI	OR		95% CI	OR		95% CI
History of depression												
No	Ref			Ref			Ref			Ref		
Yes	**3.48**	***	2.12 - 5.70	**2.56**	**	1.25 - 5.26	**7.01**	***	3.71 - 13.27	**2.58**	**	1.23 - 5.43
Timing of first prenatal care visit												
1st trimester	Ref			Ref			Ref			Ref		
2nd trimester or later	**1.46**	*	1.05 - 2.05	**1.70**	**	1.07 - 2.71	0.78		0.4 - 1.52	**1.72**	**	1.07 - 2.76
Parity												
0, First-time mom	**1.43**	*	1.08 - 1.89	1.49		0.99 - 2.22	1.17		0.70 - 1.96	**1.55**	***	1.02 - 2.34
≥1, Not a first-time mom	Ref			Ref			Ref			Ref		
Alcohol use during pregnancy												
No	Ref			Ref			Ref			Ref		
Yes	1.30		0.72 - 2.34	1.74		0.79 - 3.86	1.45		0.52 - 4.03	0.75		0.32 - 1.78
Tobacco use during pregnancy												
No	Ref			Ref			Ref			Ref		
Yes	1.43		0.98 - 2.09	**1.85**	**	1.10 - 3.12	1.63		0.83 - 3.22	0.90		0.54 - 1.52
NICU admission												
No	Ref			Ref			Ref			Ref		
Yes	**1.63**	*	1.09 - 2.44	1.63		0.93 - 2.87	1.14		0.60 - 2.16	**1.98**	**	1.07 - 3.64
Home visitor services												
No	Ref			Ref			Ref			Ref		
Yes	**1.48**	*	1.02 - 2.16	1.64		0.98 - 2.75	1.62		0.85 - 3.07	1.25		0.70 - 2.22
Breastfeeding (ever)												
No	**2.20**	*	1.15 - 4.22	**2.61**	**	1.13 - 5.98	0.54		0.12 - 2.34	**2.92**	**	1.25 - 6.80
Yes	Ref			Ref			Ref			Ref		

** p < .05; ** p < 0.01; *** p < .001*

Psychosocial Factors

Table 20 shows the unadjusted odds ratios between the psychosocial factors and SMD. Psychosocial variables found to be significantly associated with SMD among this sample of women in Alaska include pregnancy intention, stressful life events, physical abuse, having a controlling partner, and social support. Women reporting symptoms of depression at any point in time between postpartum and 3 years later were more likely to: have an unintended pregnancy; experience a greater number of stressful life events (3 or more) in the 12 months before baby was born and also at 3 years after birth; experience physical abuse from a partner in the 12 months before baby was born and also at 3 years after birth; and have a controlling partner who threatened and made her feel unsafe in the 12 months before baby was born and also at 3 years after birth; and have no or limited social support. Results from the bivariate analyses show the following:

- **Pregnancy intendedness**. Women who had not intended to get pregnant were 1.47 times more likely to report SMD (95% OR 1.11-1.94) than women who had intended to get pregnant.
- **Stressful life events.** Women who had at least 3 stressful life events during their pregnancy and 3 years later were more likely to report SMD of any type (resolved, persistent, and incident). In particularly, women who had 6 or more stressful life events during pregnancy were 5.11 times more likely to report SMD (95% OR 2.59-10.10) and 10.02 times more likely to report persistent SMD (95% OR 3.68-27.29). Women who had experienced 6 or more stressful life events in the 3 years postpartum were 4.93 times more likely to report SMD (95% OR 2.61-9.31) and 6.49 times more likely to report incident SMD (95% OR 2.81-14.95).

- **Physical abuse.** Women who experienced physical abuse from a partner during their pregnancy were 3.15 times more likely to report SMD (95% OR 1.41-7.00). Women who experienced physical abuse from a partner at 3 years postpartum were 3.65 times more likely to report SMD (95% OR 1.70-7.83) and 6.29 times more likely to report SMD (95% OR 2.47-16.01) at that time period (incident SMD).
- **Controlling partner.** Women with a controlling partner during their pregnancy were 2.16 times more likely to report SMD (95% OR 1.07-4.38). Women who reported having a controlling partner at 3 years postpartum were 4.53 times more likely to report SMD (95% OR 2.17-9.46) and 5.47 times more likely to report SMD (95% OR 2.25-13.27) at that time period (incident SMD).
- **Social support.** Women without any social support were 2.42 times more likely to report SMD (1.79-3.27) than women with social support.

Summary

When considered individually in the logistic regression model, the factors significantly associated with increased risk of SMD at any point in the 3 years postpartum are:

- Being between 20-24 years old;
- Alaskan Native or Asian/Pacific Islander;
- Having less than 12 years of education;
- Household income of $69,000 or less;
- Having Medicaid, WIC, or home visiting services;
- Unmarried;
- Having a history of depression;
- Initiating prenatal care in the second trimester or later;

- Being a first-time mother;
- Not ever having breastfed;
- Unintended pregnancy;
- Experiencing more than 3 stressful life events during pregnancy or 3 years later;
- Experiencing intimate partner violence during pregnancy or 3 years later; and
- Having no social support.

Table 20. Bivariate logistic and multinomial regressions of psychosocial characteristics and type of SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (unadjusted odds ratio)

	SMD			Type of SMD								
				Resolved			Persistent			Incident		
	OR		95% CI	OR		95% CI	OR		95% CI	OR		95% CI
Pregnancy intendedness												
Unintended	**1.47**	**	1.11 - 1.94	1.42		0.95 - 2.12	1.28		0.76 - 2.16	**1.66**	**	1.10 - 2.50
Intended	Ref			Ref			Ref			Ref		
Stressful life events												
None	Ref			Ref			Ref			Ref		
1-2 stressors	1.21		0.85 - 1.72	1.12		0.67 - 1.86	1.11		0.55 - 2.22	1.39		0.83 - 2.32
3-5 stressors	**2.02**	*	1.36 - 2.99	**1.80**	**	1.03 - 3.15	**2.42**	**	1.17 - 5.03	**2.04**	**	1.14 - 3.64
6 or more stressors	**5.11**	*	2.59 - 10.10	**4.03**	***	1.64 - 9.86	**10.02**	***	3.68 - 27.29	**3.48**	**	1.29 - 9.39
Stressful life events, 3 years later												
None	Ref			Ref			Ref			Ref		
1-2 stressors	1.28		0.90 - 1.80	1.57		0.97 - 2.55	1.07		0.54 - 2.10	1.10		0.64 - 1.88
3-5 stressors	**2.35**	***	1.60 - 3.44	**1.91**	**	1.11 - 3.29	**2.73**	**	1.17 - 5.03	**2.56**	***	1.45 - 4.50
6 or more stressors	**4.93**	***	2.61 - 9.31	**4.01**	**	1.55 - 10.39	**4.08**	***	1.66 - 10.00	**6.49**	***	2.81 - 14.98
Physical abuse												
No	Ref			Ref			Ref			Ref		
Yes	**3.15**	**	1.41 - 7.00	**3.34**	**	1.19 - 9.34	1.52		0.42 - 5.45	**4.03**	***	1.54 - 10.56
Physical abuse, 3 years later												
No	Ref			Ref			Ref			Ref		
Yes	**3.65**	***	1.70 - 7.83	2.34		0.70 - 7.75	2.00	*	0.75 - 5.30	**6.29**	***	2.47 - 16.01
Controlling partner												
No	Ref			Ref			Ref			Ref		
Yes	**2.16**	*	1.07 - 4.38	**2.97**	**	1.24 - 7.13	1.65		0.56 - 4.88	**1.63**		0.55 - 4.80
Controlling partner, 3 years later												
No	Ref			Ref			Ref			Ref		
Yes	**4.52**	***	2.17 - 9.46	**4.35**	***	1.60 - 11.87	**3.41**	**	1.08 - 10.77	**5.47**	***	2.25 - 13.27
Social support												
No	**2.42**	***	1.79 - 3.27	**2.26**	***	1.48 - 3.45	**2.60**	***	1.54 - 4.38	**2.50**	***	1.60 - 3.88
Yes	Ref			Ref			Ref			Ref		

** p < .05; ** p < 0.01; *** p < .001*

4.3.2 Multiple Regressions: SMD

Results from five successive multiple regression models of the binary SMD outcome are presented in Table 21. The odds ratio of all predictors is included in the Full Model. These regressions show whether group differences persist after controlling for specific sociodemographic characteristics, maternal health, and psychosocial variables.

Model 1a included a subset of primary sociodemographic variables. The R^2 value of 0.03 of Model 1a suggests that age, race, education, and rurality accounts for 3% of the variation in SMD. Adding all sociodemographic variables and preconception health characteristics in Model 1b accounts for 9% of the variance in SMD. Model 2, which includes sociodemographics, perinatal health, and psychosocial characteristics during pregnancy, accounts for 11% of the variation in SMD. Model 3, which includes sociodemographics, perinatal health, and psychosocial characteristics after pregnancy, accounts for 14% of the variation in SMD. The Full Model includes all predictor variables and the addition of government programs Medicaid, WIC, and home visiting, which account for 15% of the variance in SMD. Compared to Model 3, Medicaid, WIC, and home visiting services account for 1% of the variance in SMD.

Most of the variance in SMD remains unaccounted for in our models. There are likely other important variables that I have not included in the models, due to the data not being available in PRAMS and CUBS, such as genetic predisposition of mental health disorders, biological factors, and self-esteem. Regardless, the models developed in this research help us better understand relationships between variables and their effect on SMD. Below, I highlight the significant findings from the models.

Age

While the unadjusted odds ratios from the bivariate analyses had previously shown that younger women were more likely to report SMD, I conducted supplementary Pearson chi-square tests for independence to find that age is significantly associated with other variables in the models, including income, marital status, parity, Medicaid, and WIC. More women under 19 years have lower incomes, are not married, are first-time mothers, and have Medicaid and WIC.

Race/ethnicity

As shown in Model 1a, when controlling for age, education, and rurality, Asian/Pacific Islander women have 2.39 times greater odds than White women of reporting SMD (95% CI 1.33-4.29). This increased odds of SMD for Asian/Pacific Islander women persists in all subsequent models, including the Full Model with all predictors. Holding constant age, education, rurality, income, marital status, pregnancy intention, history of depression, parity, timing of first prenatal care visit, alcohol use, tobacco use, experiencing stressful life events, physical abuse, having a controlling partner, NICU admission, breastfeeding, social support, Medicaid beneficiary, WIC recipient, and home visitor services, the odds of an Asian/Pacific Islander woman reporting SMD are 2.41 times greater than the odds of a White woman (95% CI 1.31-4.44). The models show that Asian/Pacific Islander women have higher odds of SMD, regardless of all other factors.

Though not statistically significant, it is still worth noting that the odds of SMD are greater for non-White women than for White women. Controlling for all other sociodemographic, maternal health, and psychosocial variables, Alaskan Native mothers

and Hispanic mothers also have greater odds of reporting SMD (Alaskan Native aOR 1.11, 95% CI 0.75-1.66 and Hispanic aOR 1.66, 95% CI 0.65-4.2).

Education

While education was a significant predictor of SMD in Model 1a, education is no longer significant when income is added in Model 1b and subsequent models. Education and income are correlated in general, and a Pearson chi-square test shows that there is a relationship between education and income in this sample. When income is added, education's effect on SMD diminishes.

Income

When income was introduced in Model 1b, it was a significant predictor of SMD. Controlling for age, race/ethnicity, education, rurality, marital status, pregnancy intendedness, history of depression, and parity, women with household incomes less than $18,000 had greater odds of reporting SMD than women with household incomes of $98,0001 or more (aOR 2.09, 95% 1.11-3.94). However, income's effect on SMD diminishes and is no longer significant in subsequent models when maternal health and psychosocial characteristics are added. This suggests that the variance observed between income and SMD may be due to differences in factors like stressful life events. In fact, the types of stressful life events asked in PRAMS and CUBS are about employment or finances: becoming homeless, job loss (partner or individual), reduction in hours, problems paying bills, moving, and divorce. As a whole, these stressful life events explain more about the financial situation of a woman than income alone.

Though not statistically significant, the odds of SMD for women with household incomes of $69,001 to $98,000 remains stable throughout the models, indicating that

their incomes are not affected by maternal health and psychosocial characteristics. Women in the $69,001 to $98,000 income category may experience fewer financial stressors (or conversely, women with fewer financial stressors fall in the $69,001 to 98,000 category), thereby protecting them from SMD.

Marital status

As shown in Model 1b and again in Model 2, the odds of unmarried women reporting SMD were 1.54 greater than the odds of married women (95% CI 1.06-2.25). However, when maternal health and psychosocial variables were added in Model 3 and the Full Model, marital status was no longer significant. Marital status and social support are correlated, and social support may be a stronger predictor of SMD.

History of depression

History of depression is a large, significant predictor of SMD, and its effect persists even after additional variables are included in the model. In Model 1b, history of depression was introduced. Results from Model 1b show that holding constant race, education, rurality, income, marital status, pregnancy intention, and parity, the odds of a woman with a history of depression reporting SMD are 3.88 times that as the odds of woman without a history of depression (95% CI 2.39-6.30). A history of depression remains a risk factor for SMD in all subsequent models, including the Full Model. After controlling for all other sociodemographic, maternal health, and psychosocial variables, women with a history of depression have 3.54 times greater odds of reporting SMD than a woman without a history of depression (95% CI 2.10-5.95).

Parity

After controlling for sociodemographic, maternal health, and psychosocial

variables, first-time mothers had anywhere from 1.45 to 1.54 greater odds of reporting SMD. This increased odds of reporting SMD for first-time mothers was consistent in Models 1b, 2, 3, and the Full Model. As mentioned earlier, parity is associated with age: first-time mothers are younger.

Stressful life events

Stressful life events, both in the pregnancy period and in the 3 years following the baby's birth, are significant predictors of SMD. Holding all other variables constant, the odds of women experiencing 6 or more stressors reporting SMD are 2.39 times greater than the odds of women without any stressful events (95% CI 1.13-5.07). Similarly, holding all other variables constant, women experiencing 6 or more stressors in the 3 years after birth had 2.19 times the odds of reporting SMD than women without any stressful events (95% CI 1.08-4.44).

Social support

The odds of SMD are 1.86 times greater for women with no social support than for those with social support, holding all other variables constant (95% CI 1.32-2.61). Regardless of marital status, having social support is a protective factor against SMD.

Other variables

Other variables that had previously been significant in the bivariate regressions but are no longer significant in the full model include: pregnancy intention, timing of prenatal care, NICU admission, breastfeeding, physical abuse, having controlling partner, Medicaid, WIC, and home visitor services. After controlling for additional sociodemographic, perinatal health, and psychosocial variables, the odds of SMD for women who had unintended pregnancies decrease to 0.97. There may be a relationship

between unintended pregnancy and delayed prenatal care Women with unintended pregnancies are more likely to delay initiation of prenatal care until after the first trimester than women with intended pregnancies (Cheng, 2009). The delay in prenatal care may be due to a woman simply not recognizing that she is pregnant. One could hypothesize that unintended pregnancy increases the likelihood of stress or anxiety during pregnancy, which in turn increases the likelihood for postpartum depression.

The relationship between maternal depression and breastfeeding is not clear. It is plausible that mothers who are depressed are less likely to breastfeed; however, it is also plausible that breastfeeding may reduce depression symptoms by increasing the mother-baby bond.

Some studies have shown that intimate partner violence (IPV), including physical abuse and having a controlling partner, have an indirect effect on maternal depression through greater chronic stress and reduced social support. While men and women of all social strata experience IPV, incidence is higher for women of certain social and ethnic groups. IPV risk factors include a history of violence, younger age, being unmarried, belonging to an ethnic minority group, low-income, low education, and stress (Charles & Perreira, 2007; Coker, Smith, Bethea, King, & McKeown, 2000; Finnbogadóttir, Dykes, & Wann-Hansson, 2014; Saltzman, Johnson, Gilbert, & Goodwin, 2003; Taillieu & Brownridge, 2010). Coker et al. (2002) found that social support protects against the negative effects of partner violence on mental health. In addition, women who received consistent social support were significantly less likely to experience anxiety and depression (Coker et al., 2002). Social support is likely to be a protective factor against SMD for women experiencing physical abuse or having a controlling partner.

Medicaid and WIC appear to be protective factors for SMD in that the odds for SMD are lower for women with Medicaid and WIC. Medicaid and WIC are programs for low-income households, and they may help to alleviate financial stress and increase access to medical care for families**.** Holding constant all other variables, the odds that a woman on Medicaid are only 0.86 times as high as the odds that a woman without Medicaid will report SMD. In other words, women with Medicaid have a 14% decrease in the odds of SMD (95% CI 0.55-1.33). Likewise, women with WIC are less likely to report SMD: they have 0.87 times the odds, or 13% decrease in the odds, of women without WIC reporting SMD (95% CI 0.58-1.31). However, women receiving home visiting services have a 1.29 times greater odds of reporting SMD than those without home visiting services (95% CI 0.88-1.89).

Summary

When considered together in the full multiple logistic regression model, the factors significantly associated with increased likelihood of SMD at any point in the 3 years postpartum are:

- Being an Asian/Pacific Islander;
- Having a history of depression;
- Being a first-time mother;
- Experiencing 6 or more stressful life events during pregnancy and 3 or more stressful life events 3 years later; and
- Having no social support.

Table 21. Multiple logistic regression models of binary SMD outcome, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (adjusted odds ratio)

	Model 1a		Model 1b		Model 2		Model 3		Full Model	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age										
19 years and under	0.96	0.55 - 1.69	**0.48** *	0.25 - 0.91	**0.46** *	0.24 - 0.88	0.48 *	0.25 - 0.92	**0.51** *	0.27 - 0.98
20 - 24 years	1.15	0.79 - 1.67	0.81	0.54 - 1.20	0.81	0.54 - 1.21	0.91	0.60 - 1.39	0.98	0.64 - 1.48
25 - 34 years	Ref		Ref		Ref		Ref		Ref	
35 years and older	0.80	0.51 - 1.27	0.83	0.51 - 1.35	0.81	0.50 - 1.31	0.80	0.51 - 1.25	0.80	0.51 - 1.26
Race/ethnicity										
White	Ref		Ref		Ref		Ref		Ref	
Alaskan Native	1.14	0.79 - 1.64	1.06	0.72 - 1.56	1.09	0.74 - 1.61	1.10	0.74 - 1.63	1.11	0.75 - 1.66
Asian/Pacific Islander	**2.39** **	1.33 - 4.29	**2.55** **	1.40 - 4.63	**2.77** **	1.51 - 5.06	2.33 **	1.26 - 4.31	**2.41** **	1.31 - 4.44
Hispanic	1.83	0.73 - 4.59	1.84	0.73 - 4.65	1.80	0.66 - 4.88	1.62	0.63 - 4.15	1.66	0.65 - 4.20
Other/Mixed	1.18	0.76 - 1.83	1.14	0.72 - 1.80	1.16	0.73 - 1.84	1.15	0.72 - 1.83	1.18	0.74 - 1.89
Education										
Less than 12 years	**2.05** *	1.17 - 3.61	1.55	0.80 - 3.02	1.57	0.78 - 3.17	1.48	0.74 - 2.95	1.43	0.71 - 2.87
12 years	**1.65** *	1.06 - 2.57	1.24	0.74 - 2.09	1.26	0.74 - 2.14	1.12	0.64 - 1.95	1.14	0.66 - 1.99
13-15 years	1.03	0.70 - 1.54	0.87	0.56 - 1.35	0.86	0.55 - 1.35	0.81	0.51 - 1.30	0.81	0.51 - 1.29
More than 16 years	Ref		Ref		Ref		Ref		Ref	
Rural/urban										
Rural	1.00	0.72 - 1.40	0.98	0.70 - 1.37	1.01	0.72 - 1.42	1.08	0.76 - 1.52	1.12	0.78 - 1.59
Urban	Ref		Ref		Ref		Ref		1.00	
Income										
Less than $18,000			**2.09** *	1.11 - 3.94	1.68	0.87 - 3.21	1.20	0.63 - 2.30	1.45	0.73 - 2.89
$18,001 to $37,000			1.22	0.68 - 2.21	1.07	0.57 - 1.95	0.85	0.47 - 1.56	0.98	0.51 - 1.87
$37,001 to $69,000			1.43	0.85 - 2.39	1.30	0.77 - 2.20	1.23	0.73 - 2.09	1.35	0.78 - 2.32
$69,001 to $98,000			1.08	0.64 - 1.85	1.02	0.58 - 1.75	1.01	0.58 - 1.74	1.07	0.62 - 1.85
$98,001 or more			Ref		Ref		Ref		Ref	
Marital status										
Married			Ref		Ref		Ref		Ref	
Unmarried			**1.54** *	1.07 - 2.21	**1.54** *	1.06 - 2.25	1.32	0.90 - 1.96	1.35	0.91 - 2.02
Pregnancy intendedness										
Unintended			1.10	0.80 - 1.49	1.03	0.75 - 1.41	0.98	0.71 - 1.36	0.97	0.70 - 1.35
Intended			Ref		Ref		Ref		Ref	
History of depression										
No			Ref		Ref		Ref		Ref	
Yes			**3.88** ***	2.39 - 6.30	**3.41** ***	2.06 - 5.65	**3.15** ***	1.86 - 5.33	**3.54** ***	2.10 - 5.95

Table 21. (continued)

	Model 1a		Model 1b		Model 2		Model 3		Full Model	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Parity										
0, First-time mom			**1.52** *	1.10 - 2.09	**1.54** **	1.11 - 2.25	**1.54** **	1.11 - 2.13	**1.45** *	1.04 - 2.02
≥1, Not a first-time mom			Ref		Ref		Ref		Ref	
Timing of first prenatal care visit										
1st trimester					Ref		Ref		Ref	
2nd trimester and after					1.14	0.80 - 1.64	1.13	0.78 - 1.64	1.12	0.76 - 1.64
Alcohol use during pregnancy										
No					Ref		Ref		Ref	
Yes					1.78	0.90 - 3.53	1.84	0.92 - 3.67	1.82	0.91 - 3.65
Tobacco use during pregnancy										
No					Ref		Ref		Ref	
Yes					0.90	0.59 - 1.40	0.77	0.50 - 1.19	0.84	0.54 - 1.30
Stressful life events										
None					Ref		Ref		Ref	
1-2 stressors					1.12	0.78 - 1.60	1.13	0.78 - 1.63	1.12	0.78 - 1.61
3-5 stressors					1.58 *	1.04 - 2.42	1.49	0.95 - 2.33	1.42	0.90 - 2.24
6 or more stressors					2.77 *	1.39 - 5.50	**2.48** *	1.16 - 5.30	**2.39** *	1.13 - 5.07
Physical abuse										
No					Ref		Ref		Ref	
Yes					1.63	0.71 - 3.74	1.84	0.80 - 4.27	1.83	0.77 - 4.36
Controlling partner										
No					Ref		Ref		Ref	
Yes					0.93	0.42 - 2.09	0.78	0.89 - 2.11	0.77	0.33 - 1.81
NICU admission										
No							Ref		Ref	
Yes							1.37	0.82 - 3.93	1.35	0.86 - 2.10
Breastfeeding (ever)										
No							Ref		2.03	0.94 - 4.38
Yes							1.79	0.79 - 3.79	Ref	
Stressful life events, 3 years later										
None							Ref		Ref	
1-2 stressors							1.25	0.86 - 1.83	1.28	0.87 - 1.86
3-5 stressors							**1.79** **	1.16 - 2.76	**1.83** **	1.18 - 2.84
6 or more stressors							**2.21** *	1.11 - 4.39	**2.19** *	1.08 - 4.44

Table 21. (continued)

	Model 1a		Model 1b		Model 2		Model 3		Full Model	
	OR	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**	**OR**	**95% CI**
Physical abuse, 3 years later										
No							Ref		Ref	
Yes							1.27	0.42 - 3.88	1.31	0.44 - 3.92
Controlling partner, 3 years later										
No							Ref		Ref	
Yes							2.05	0.74 - 5.68	2.04	0.75 - 5.55
Social support										
No							**1.80** ***	1.27 - 2.53	**1.86** ***	1.32 - 2.61
Yes							Ref		Ref	
Medicaid beneficiary										
No									Ref	
Yes									0.86	0.55 - 1.33
WIC recipient										
No									Ref	
Yes									0.87	0.58 - 1.31
Home visitor services										
No									Ref	
Yes									1.29	0.88 - 1.89
R^2 (Cox-Snell)		0.03		0.09		0.11		0.14		0.15

** p < .05; ** p < .01; *** p < .001*

4.3.3 Multiple Regressions: Resolved, Persistent, and Incident SMD

Similar to the binary SMD outcome, I conduct hierarchical regressions of the nominal SMD outcome (resolved, persistent, incident). Results from five successive multiple regression models of the nominal SMD outcome and sociodemographic characteristics, maternal health, and psychosocial factors are presented in Tables 22–26. The odds ratio of all predictors is included in the Full Model in Table 20. These multinomial models supplement the models presented in Table 15, providing additional information about which variables affect whether a woman overcomes her depressive symptoms (resolved), continues to suffer from depressive symptoms in the three years after the birth of her child (persistent), or develops SMD three years after childbirth (incident). Note that because the PRAMS and CUBS data are captured at two points in time—PRAMS being 2-6 months after birth and CUBS at any point 3 years after birth—my definitions of resolved, persistent, and incident SMD are limited to two specific points in time.

These models offer a profile of women who report persistent—possibly overlooked, untreated—SMD. Women who report persistent SMD are more likely to be of Asian/Pacific Island descent, have a household income of $37,001 - $98,000, have a history of depression, experience 6 or more stressful life events, and have no social support. Below, I highlight significant findings from the models as they relate to resolved, persistent, and incident SMD.

Race/ethnicity

As shown in Model 1a, when controlling for age, education, and rurality, Asian/Pacific Islander women had 3.25 times greater odds than White women of

reporting persistent SMD (95% CI 1.33-7.91). This increased odds of persistent SMD for Asian/Pacific Islander women remains in all subsequent models after controlling for more variables and is higher in Model 1b and Model 2. Model 1b focuses on sociodemographics and health characteristics *before pregnancy* and adds pregnancy intention, history of depression, and parity. Model 2 includes sociodemographic, perinatal health, and psychosocial characteristics *during pregnancy* and adds prenatal care, alcohol and tobacco use during pregnancy, stressful life events, abuse, and controlling partner. In Model 2, after controlling for all other variables in the model, Asian/Pacific Islander women have 5.4 times greater odds of reporting persistent SMD than White women (95% CI 2.22-13.1). In the Full Model, holding all other variables constant, the odds of having persistent SMD are 4.4 times greater for Asian/Pacific Islander women than White women (95% CI 1.79-10.80). In the previous multiple regression models of the binary SMD outcome, I did find that that Asian/Pacific Islander women had higher odds of reporting SMD in general. This supplementary analysis shows that Asian/Pacific Islander women have higher odds of chronic, persistent, and possibly overlooked and untreated SMD.

Results from these analyses also reveal that Hispanic women in Alaska have a significantly higher likelihood of incident SMD than White women. The odds having incident SMD are 3.96 times greater for Hispanic women than for White women, holding age, education, and rurality constant (95% CI 1.39-11.26). This increased odds continues throughout subsequent models. In the Full Model, holding all other variables constant, the odds of having incident SMD are 3.53 times greater for Hispanic women than for White women (95% CI 1.40-8.92).

Income

When income was introduced in Model 1b, it was a significant predictor of persistent SMD. Holding constant age, race/ethnicity, education, rurality, marital status, pregnancy intention, history of depression, and parity, women with a household income of less than $18,000 were 4.48 times more likely to report persistent SMD than women with a household income of $98,001 or more (95% CI 1.26-15.94). In addition, women with a household income between $37,001 and $69,000 were 4.72 times more likely to report persistent SMD (95% CI 1.55-14.36). Women with household incomes of $69,001 to $98,000 also had increased odds of persistent SMD. In the Full Model, after controlling for all sociodemographic, maternal health, and psychosocial variables, it appears that those at greatest risk of persistent SMD have household incomes between $37,001 and $98,000. Holding all other variables, including stressful life events, constant, women with a household income between $37,001 and $69,000 were 4.36 times more likely to report persistent SMD (95% CI 1.27-14.95). Women with household incomes of $69,000 to $98,001 were 3.44 times more likely to report persistent SMD (95% CI 1.00-11.86).

In the bivariate analyses, households with incomes less than $18,000 had significantly higher odds of resolved, persistent, and incident SMD. While the association between income and resolved SMD is no longer significant in the full model, the pattern remains, and comparing the models offers insights about how SMD may resolve. In Model 3, holding constant all other variables, the odds that a woman with a household income less than $18,000 are only 95% (0.95 times) as high as the odds that a woman with a household income of $98,001 or more will have resolved SMD. In the full model,

after the addition of Medicaid, WIC, and home visiting services, and holding constant all variables, women with household incomes less than $18,000 are 1.17 times more likely to have resolved SMD—or have SMD resolve, possibly addressed and treated.

History of depression

Consistent with previous findings, history of depression is a significant predictor of SMD, and its effect is especially pronounced for persistent SMD, though it is also related to resolved and incident SMD. Results from Model 1b show that holding constant race, education, rurality, income, marital status, pregnancy intention, and parity, the odds of a woman with a history of depression reporting persistent SMD are 8.85 times greater than the odds of woman without a history of depression (95% CI 4.38-17.86). The odds of a woman with a history of depression reporting resolved SMD are 2.76 times greater than the odds of woman without a history of depression (95% CI 1.38-5.52). In addition, women with a history of depression have 2.67 times the odds of reporting incident depression (95% CI 1.32-5.43). History of depression remains a risk factor for resolved, persistent, and incident SMD in all subsequent models, including the Full Model. After controlling for all other sociodemographic, maternal health, and psychosocial variables, the odds that a woman with a history of depression reports SMD is 7.43 times greater than the odds of a woman without a history of depression (95% CI 3.38-16.33).

Parity

After controlling for sociodemographic, maternal health, and psychosocial variables, the odds of first-time moms reporting incident SMD were 1.67 times the odds of those who were not first-time moms. However, parity did was not significantly associated with resolved or persistent SMD.

Breastfeeding

Having initiated breastfeeding was significantly associated with resolved SMD. After controlling all other variables, the odds that a woman who had initiated breastfeeding reports resolved SMD is 2.79 times greater than the odds of a woman who had not initiated breastfeeding (95% CI 3.38-16.33). The relationship between breastfeeding and resolved SMD becomes statistically significant only after including Medicaid, WIC, and home visiting services, likely because women in these federal assistance programs receive strong messages that promote and emphasize the benefits of breastfeeding. I conducted supplementary Pearson chi-square tests for independence and find that breastfeeding initiation age is significantly associated with Medicaid, WIC, and home visiting.

Stressful life events

As shown in Model 2, a woman experiencing 6 or more stressful life events during her pregnancy is 6.71 times more likely to report persistent SMD than a woman experiencing no stressful life events, after controlling for sociodemographics, maternal health, and a number of other psychosocial characteristics during pregnancy (95% CI 2.25-20.0). The effect of stressful life events attenuates slightly after adding NICU admission, breastfeeding, stressful life events ta 3 years, physical abuse at 3 years, and controlling partner at 3 years, but it remains significant. Finally, holding constant all variables, including Medicaid, WIC, and home visiting, a woman experiencing 6 or more stressful life events during her pregnancy is 4.86 times more likely to report persistent SMD than a woman experiencing no stressful life events (95% CI 1.48-15.98). The number of stressful life events at 3 years has a significant association with incident

depression (aOR 2.36, 95% CI1.22-4.56 for mothers reporting 3-5 stressors, and aOR 4.03, 95% CI 1.54-10.57 for mothers reporting 6 stressors).

Social support

Social support is an important protective factor against all types of SMD. The odds of persistent SMD are 2.03 times greater for women with no social support than for those with social support, holding all other variables constant (95% CI 1.15-3.57). The odds of resolved SMD are 1.81 times greater for women with no social support than for those with social support, holding all other variables constant (95% CI 1.15-3.57). The odds of incident SMD are 1.70 times greater for women with no social support than for those with social support (95% CI 1.04-2.78).

Summary

When considered together in the multiple logistic regression model, the factors significantly associated with increased likelihood of having persistent SMD (depressive symptoms at postpartum and also up to 3 years postpartum) are

- Being Asian/Pacific Islander;
- Having Household income between $37,001 and $98,000;
- Having a history of depression;
- Experiencing 6 or more stressful life events during pregnancy; and
- Having no social support.

Table 22. Model 1a, multiple logistic regression of resolved, persistent, and incident SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (adjusted odds ratio)

	Model 1a					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Age						
19 years and under	0.99	0.43 - 2.26	1.61	0.68 - 3.77	0.62	0.25 - 1.53
20 - 24 years	0.99	0.61 - 1.62	1.01	0.50 - 2.06	1.46	0.85 - 2.49
25 - 34 years	Ref		Ref		Ref	
35 years and older	0.43	0.19 - 0.97	0.70	0.33 - 1.49	1.39	0.73 - 2.66
Race/ethnicity						
White	Ref		Ref		Ref	
Alaskan Native	1.06	0.65 - 1.75	0.98	0.50 - 1.91	1.33	0.77 - 2.29
Asian/Pacific Islander	2.24	0.97 - 5.18	**3.25** **	1.33 - 7.91	1.98	0.80 - 4.88
Hispanic	0.91	0.15 - 5.75	0.36	0.09 - 1.46	**3.96** **	1.39 - 11.26
Other/Mixed	1.40	0.77 - 2.55	0.69	0.31 - 1.52	1.27	0.65 - 2.48
Education						
Less than 12 years	1.72	0.79 - 3.73	1.88	0.69 - 5.14	**2.53** *	1.05 - 6.07
12 years	1.62	0.86 - 3.03	1.46	0.66 - 3.22	1.83	0.92 - 3.63
13-15 years	1.09	0.60 - 1.99	1.13	0.54 - 2.35	0.91	0.51 - 1.62
More than 16 years	Ref		Ref		Ref	
Rural/urban						
Rural	0.96	0.61 - 1.51	0.96	0.52 - 1.76	1.09	0.66 - 1.80
Urban	Ref		Ref		Ref	

** p < .05; ** p < .01; *** p < .001*

Table 23. Model 1b, multiple logistic regression of resolved, persistent, and incident SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (adjusted odds ratio)

	Model 1b					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Age						
19 years and under	0.52	0.21 - 1.29	1.13	0.43 - 3.00	0.25	0.09 - 0.70
20 - 24 years	0.72	0.41 - 1.26	0.81	0.41 - 1.57	0.93	0.53 - 1.63
25 - 34 years	Ref		Ref		Ref	
35 years and older	0.44	0.19 - 1.05	0.70	0.32 - 1.53	1.43	0.76 - 2.72
Race/ethnicity						
White	Ref		Ref		Ref	
Alaskan Native	1.00	0.59 - 1.70	1.00	0.59 - 1.70	1.03	0.49 - 2.15
Asian/Pacific Islander	2.21	0.96 - 5.08	**4.40** ***	1.72 - 11.23	1.99	0.76 - 5.18
Hispanic	0.99	0.14 - 6.85	0.38	0.08 - 1.72	**3.68** **	1.38 - 9.84
Other/Mixed	1.36	0.74 - 2.52	0.69	0.30 - 1.57	1.15	0.58 - 2.30
Education						
Less than 12 years	1.35	0.55 - 3.33	1.40	0.47 - 4.14	1.80	0.65 - 4.97
12 years	1.31	0.60 - 2.84	1.02	0.42 - 2.50	1.24	0.60 - 2.55
13-15 years	1.03	0.53 - 2.01	0.81	0.38 - 1.72	0.72	0.39 - 1.36
More than 16 years	Ref		Ref		Ref	
Rural/urban						
Rural	0.95	0.60 - 1.52	0.94	0.52 - 1.69	1.06	0.64 - 1.75
Urban	Ref		Ref		Ref	
Income						
Less than $18,000	1.82	0.75 - 4.43	**4.48** *	1.26 - 15.94	1.83	0.76 - 4.45
$18,001 to $37,000	1.08	0.44 - 2.64	2.48	0.79 - 7.77	1.09	0.51 - 2.32
$37,001 to $69,000	0.85	0.39 - 1.84	**4.72** **	1.55 - 14.36	1.40	0.70 - 2.81
$69,001 to $98,000	0.96	0.46 - 2.02	**3.69** **	1.18 - 11.57	0.55	0.24 - 1.27
$98,001 or more	Ref		Ref		Ref	
Marital Status						
Married	Ref		Ref		Ref	
Unmarried	1.41	0.86 - 2.31	1.23	0.64 - 2.37	**1.91** *	1.09 - 3.37
Pregnancy Intention						
Unintended	1.11	0.70 - 1.76	0.89	0.54 - 1.48	1.21	0.76 - 1.92
Intended	Ref		Ref		Ref	
History of depression						
No	Ref		Ref		Ref	
Yes	**2.76** **	1.38 - 5.52	**8.85** ***	4.38 - 17.86	**2.67** **	1.32 - 5.43
Parity						
0, First-time mom	1.50	0.95 - 2.35	1.15	0.67 - 1.97	**1.77** *	1.09 - 2.89
≥1, Not a first-time mom	Ref		Ref		Ref	

** p < .05; ** p < .01; *** p < .001*

Table 24. Model 2, multiple logistic regression of resolved, persistent, and incident SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (adjusted odds ratio)

	Model 2					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Age						
19 years and under	0.56	0.23 - 1.38	1.25	0.49 - 3.20	0.20	0.07 - 0.57
20 - 24 years	0.75	0.43 - 1.31	0.90	0.45 - 1.84	0.89	0.51 - 1.57
25 - 34 years	Ref		Ref		Ref	
35 years and older	0.43	0.19 - 0.99	0.65	0.28 - 1.48	1.38	0.73 - 2.61
Race/ethnicity						
White	Ref		Ref		Ref	
Alaskan Native	1.01	0.60 - 1.72	1.12	0.54 - 2.33	1.23	0.70 - 2.18
Asian/Pacific Islander	**2.63** **	1.15 - 6.04	**5.40** ***	2.22 - 13.14	1.86	0.69 - 4.99
Hispanic	1.08	0.14 - 8.07	0.26	0.05 - 1.54	**3.45** **	1.25 - 9.52
Other/Mixed	1.44	0.78 - 2.66	0.69	0.30 - 1.57	1.15	0.58 - 2.27
Education						
Less than 12 years	1.12	0.45 - 2.81	1.43	0.46 - 4.41	2.13	0.74 - 6.12
12 years	1.26	0.58 - 2.75	0.96	0.38 - 2.42	1.31	0.63 - 2.73
13-15 years	1.03	0.52 - 2.04	0.76	0.35 - 1.66	0.70	0.37 - 1.32
More than 16 years	Ref		Ref		Ref	
Rural/urban						
Rural	0.98	0.61 - 1.57	0.99	0.56 - 1.72	1.05	0.64 - 1.72
Urban	Ref		Ref		Ref	
Income						
Less than $18,000	1.45	0.60 - 3.55	3.34	0.88 - 12.67	1.52	0.62 - 3.74
$18,001 to $37,000	0.93	0.38 - 2.27	2.00	0.61 - 6.57	0.97	0.46 - 2.09
$37,001 to $69,000	0.76	0.34 - 1.68	**4.14** **	1.32 - 13.01	1.33	0.66 - 2.68
$69,001 to $98,000	0.91	0.43 - 1.92	3.25	1.00 - 10.55	0.53	0.23 - 1.20
$98,001 or more	Ref		Ref		Ref	
Marital status						
Married	Ref		Ref		Ref	
Unmarried	1.27	0.75 - 2.14	1.29	0.65 - 2.57	**2.05** **	1.19 - 3.54
Pregnancy intendedness						
Unintended	1.01	0.63 - 1.62	0.84	0.50 - 1.40	1.18	0.73 - 1.89
Intended	Ref		Ref		Ref	
History of depression						
No	Ref		Ref		Ref	
Yes	**2.51** **	1.24 - 5.09	**6.66** ***	3.08 - 14.42	**2.60** **	1.29 - 5.23
Parity						
0, First-time mom	1.56	0.99 - 2.47	1.11	0.64 - 1.93	**1.79** *	1.09 - 2.96
≥1, Not a first-time mom	Ref		Ref		Ref	
Timing of First Prenatal Care Visit						
1st trimester	Ref		Ref		Ref	
2nd trimester and after	1.40	0.87 - 2.24	0.50	0.25 - 1.03	1.38	0.83 - 2.29
Alcohol use during pregnancy						
No	Ref		Ref		Ref	
Yes	2.28	0.95 - 5.46	2.57	0.86 - 7.74	1.06	0.41 - 2.75
Tobacco use during pregnancy						
No	Ref		Ref		Ref	
Yes	1.48	0.83 - 2.65	0.92	0.43 - 1.97	0.43	0.22 - 0.82

Table 24. Model 2 (continued)

	Model 2					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Stressful life events						
None	Ref		Ref		Ref	
1-2 stressors	1.06	0.63 - 1.79	1.03	0.52 - 2.04	1.28	0.75 - 2.17
3-5 stressors	1.47	0.83 - 2.60	1.99	0.87 - 4.51	1.49	0.80 - 2.75
6 or more stressors	1.90	0.81 - 4.43	**6.71** ***	2.25 - 20.02	1.88	0.61 - 5.82
Physical abuse						
No	Ref		Ref		Ref	
Yes	1.42	0.55 - 3.66	0.50	0.11 - 2.33	**3.56** **	1.25 - 10.14
Controlling partner						
No	Ref		Ref		Ref	
Yes	1.55	0.68 - 3.56	0.82	0.21 - 3.26	0.52	0.14 - 1.90

** p < .05; ** p < .01; *** p < .001*

Table 25. Model 3, multiple logistic regression of resolved, persistent, and incident SMD, Alaska PRAMS 2012-2014 and CUBS 2015-2017 (adjusted odds ratio)

	Model 3					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Age						
19 years and under	0.73	0.30 - 1.78	1.16	0.45 - 3.01	0.16	0.06 - 0.43
20 - 24 years	0.86	0.49 - 1.52	1.06	0.52 - 2.15	0.99	0.55 - 1.77
25 - 34 years	Ref		Ref		Ref	
35 years and older	0.43	0.19 - 0.99	0.64	0.27 - 1.50	1.32	0.75 - 2.34
Race/ethnicity						
White	Ref		Ref		Ref	
Alaskan Native	1.02	0.61 - 1.73	1.09	0.51 - 2.34	1.26	0.71 - 2.24
Asian/Pacific Islander	2.18	0.91 - 5.24	**4.44** ***	1.83 - 10.81	1.44	0.52 - 4.01
Hispanic	0.83	0.11 - 6.04	0.20	0.03 - 1.56	**3.52** **	1.38 - 8.97
Other/Mixed	1.49	0.81 - 2.72	0.62	0.27 - 1.42	1.18	0.60 - 2.34
Education						
Less than 12 years	1.04	0.41 - 2.62	1.15	0.37 - 3.59	1.97	0.74 - 5.23
12 years	1.07	0.48 - 2.36	0.90	0.34 - 2.37	1.13	0.54 - 2.35
13-15 years	0.97	0.48 - 1.95	0.77	0.34 - 1.74	0.61	0.32 - 1.18
More than 16 years	Ref		Ref		Ref	
Rural/urban						
Rural	1.09	0.68 - 1.76	1.00	0.56 - 1.77	1.14	0.69 - 1.91
Urban	Ref		Ref		Ref	
Income						
Less than $18,000	0.95	0.40 - 2.28	3.39	0.87 - 13.26	1.06	0.44 - 2.57
$18,001 to $37,000	0.76	0.32 - 1.79	1.77	0.52 - 6.05	0.73	0.34 - 1.57
$37,001 to $69,000	0.70	0.32 - 1.54	**4.04** **	1.23 - 13.29	1.29	0.64 - 2.61
$69,001 to $98,000	0.88	0.42 - 1.86	3.24	0.96 - 10.89	0.51	0.22 - 1.20
$98,001 or more	Ref		Ref		Ref	
Marital status						
Married	Ref		Ref		Ref	
Unmarried	1.17	0.69 - 1.98	1.13	0.57 - 2.25	1.64	0.95 - 2.85
Pregnancy intendedness						
Unintended	1.05	0.66 - 1.67	0.79	0.47 - 1.33	1.03	0.64 - 1.66
Intended	Ref		Ref		Ref	
History of depression						
No	Ref		Ref		Ref	
Yes	**2.30** **	1.11 - 4.74	**6.70** ***	3.10 - 14.50	**2.48** **	1.29 - 4.77
Parity						
0, First-time mom	1.55	0.98 - 2.44	1.09	0.62 - 1.93	**1.75** **	1.08 - 2.84
≥1, Not a first-time mom	Ref		Ref		Ref	
Timing of First Prenatal Care Visit						
1st trimester	Ref		Ref		Ref	
2nd trimester and after	1.42	0.87 - 2.30	0.46	0.25 - 0.86	1.37	0.80 - 2.33
Alcohol use during pregnancy						
No	Ref		Ref		Ref	
Yes	2.27	0.95 - 5.42	2.84	0.93 - 8.71	1.14	0.42 - 3.10
Tobacco use during pregnancy						
No	Ref		Ref		Ref	
Yes	1.25	0.73 - 2.14	0.75	0.32 - 1.74	0.37	0.18 - 0.73

Table 25. Model 3 (continued)

	Model 3								
	Resolved			Persistent			Incident		
	OR		95% CI	OR		95% CI	OR		95% CI
Stressful life events									
None	Ref			Ref			Ref		
1-2 stressors	1.15		0.67 - 1.98	0.99		0.49 - 1.99	1.25		0.74 - 2.10
3-5 stressors	1.56		0.86 - 2.81	1.79		0.74 - 4.33	1.27		0.66 - 2.43
6 or more stressors	2.07		0.82 - 5.26	**5.27**	**	1.63 - 16.99	1.51		0.48 - 4.70
Physical abuse									
No	Ref			Ref			Ref		
Yes	1.69		0.63 - 4.55	0.58		0.11 - 3.16	**4.09**	*	1.43 - 11.73
Controlling partner									
No	Ref			Ref			Ref		
Yes	1.44		0.62 - 3.30	0.74		0.18 - 3.00	0.33		0.08 - 1.34
NICU Admission									
No	Ref			Ref			Ref		
Yes	1.36		0.75 - 2.45	1.09		0.55 - 2.16	1.58		0.83 - 3.02
Breastfeeding (ever)									
No	Ref			Ref			Ref		
Yes	2.55		0.99 - 6.59	0.37		0.06 - 2.26	1.99		0.81 - 4.85
Stressful life events, 3 years later									
None	Ref			Ref			Ref		
1-2 stressors	1.54		0.94 - 2.53	0.91		0.45 - 1.82	1.18		0.65 - 2.15
3-5 stressors	1.33		0.72 - 2.47	1.71		0.82 - 3.58	**2.36**	**	1.24 - 4.51
6 or more stressors	1.62		0.65 - 4.06	1.11		0.31 - 4.03	**3.80**	**	1.46 - 9.90
Physical abuse, 3 years later									
No	Ref			Ref			Ref		
Yes	0.69		0.16 - 2.93	0.35		0.05 - 2.31	2.33		0.63 - 8.66
Controlling partner, 3 years later									
No	Ref			Ref			Ref		
Yes	**3.20**	*	1.04 - 9.87	3.28		0.60 - 17.82	1.56		0.39 - 6.25
Social support									
No	Ref			Ref			Ref		
Yes	**1.84**	**	1.11 - 3.04	**1.92**	**	1.08 - 3.39	**1.67**	**	1.04 2.69

** p < .05; ** p < .01; *** p < .001*

Table 26. Full model, multiple logistic regression of resolved, persistent, and incident SMD, Alaska PRAMS 2012-2014 & CUBS 2015-2017 (adjusted odds ratio)

	Full Model					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Age						
19 years and under	0.79	0.32 - 1.95	1.16	0.44 - 3.10	0.17	0.07 - 0.43
20 - 24 years	0.97	0.56 - 1.69	1.12	0.55 - 2.27	1.03	0.57 - 1.85
25 - 34 years	Ref		Ref		Ref	
35 years and older	0.45	0.20 - 1.03	0.61	0.26 - 1.47	1.29	0.73 - 2.30
Race/ethnicity						
White	Ref		Ref		Ref	
Alaskan Native	1.04	0.61 - 1.78	1.10	0.51 - 2.35	1.31	0.72 - 2.36
Asian/Pacific Islander	**2.45** *	1.03 - 5.81	**4.40** ***	1.79 - 10.80	1.42	0.48 - 4.23
Hispanic	0.87	0.12 - 6.24	0.21	0.03 - 1.71	**3.53** **	1.40 - 8.92
Other/Mixed	1.52	0.82 - 2.81	0.62	0.27 - 1.42	1.23	0.61 - 2.46
Education						
Less than 12 years	1.02	0.41 - 2.55	1.12	0.33 - 3.82	1.73	0.64 - 4.68
12 years	1.10	0.50 - 2.43	0.92	0.34 - 2.54	1.13	0.54 - 2.36
13-15 years	0.94	0.47 - 1.91	0.77	0.34 - 1.74	0.60	0.32 - 1.16
More than 16 years	Ref		Ref		Ref	
Rural/urban						
Rural	1.18	0.73 - 1.90	1.04	0.58 - 1.85	1.14	0.68 - 1.91
Urban	Ref		Ref		Ref	
Income						
Less than $18,000	1.17	0.45 - 3.05	3.81	0.92 - 15.79	1.22	0.50 - 3.01
$18,001 to $37,000	0.88	0.34 - 2.32	2.01	0.57 - 7.16	0.79	0.37 - 1.73
$37,001 to $69,000	0.78	0.35 - 1.74	**4.36** **	1.27 - 14.95	1.38	0.67 - 2.86
$69,001 to $98,000	0.97	0.47 - 2.03	**3.44** *	1.00 - 11.86	0.51	0.21 - 1.22
$98,001 or more	Ref		Ref		Ref	
Marital status						
Married	Ref		Ref		Ref	
Unmarried	1.21	0.71 - 2.07	1.11	0.54 - 2.29	1.72	0.97 - 3.04
Pregnancy intendedness						
Unintended	1.05	0.65 - 1.67	0.80	0.48 - 1.35	1.00	0.62 - 1.62
Intended	Ref		Ref		Ref	
History of depression						
No	Ref		Ref		Ref	
Yes	**2.68** **	1.31 - 5.48	**7.43** ***	3.38 - 16.33	**2.68** **	1.39 - 5.19
Parity						
0, First-time mom	1.47	0.92 - 2.34	1.06	0.60 - 1.88	**1.67** *	1.01 - 2.75
≥1, Not a first-time mom	Ref		Ref		Ref	
Timing of first prenatal care visit						
1st trimester	Ref		Ref		Ref	
2nd trimester and after	1.41	0.86 - 2.31	0.50	0.27 - 0.93	1.29	0.74 - 2.25
Alcohol use during pregnancy						
No	Ref		Ref		Ref	
Yes	2.20	0.91 - 5.31	3.00	0.96 - 9.35	1.11	0.39 - 3.13
Tobacco use during pregnancy						
No	Ref		Ref		Ref	
Yes	1.38	0.80 - 2.39	0.77	0.33 - 1.79	0.38	0.19 - 0.78

Table 26. Full model (continued)

	Full Model					
	Resolved		Persistent		Incident	
	OR	95% CI	OR	95% CI	OR	95% CI
Stressful life events						
None	Ref		Ref		Ref	
1-2 stressors	1.16	0.68 - 1.99	0.96	0.48 - 1.91	1.25	0.74 - 2.11
3-5 stressors	1.43	0.78 - 2.60	1.66	0.68 - 4.02	1.30	0.67 - 2.53
6 or more stressors	1.98	0.79 - 4.95	**4.86** **	1.48 - 15.98	1.30	0.42 - 4.00
Physical abuse						
No	Ref		Ref		Ref	
Yes	1.69	0.61 - 4.73	0.61	0.12 - 3.24	**3.97** **	1.35 - 11.70
Controlling partner						
No	Ref		Ref		Ref	
Yes	1.44	0.61 - 3.42	0.77	0.19 - 3.16	0.34	0.08 - 1.40
NICU Admission						
No	Ref		Ref		Ref	
Yes	1.35	0.73 - 2.48	1.08	0.54 - 2.16	1.56	0.82 - 2.95
Breastfeeding (ever)						
No	**2.79** *	1.06 - 7.32	0.46	0.08 - 2.70	2.29	0.93 - 5.67
Yes	Ref		Ref		Ref	
Stressful life events, 3 years later						
None	Ref		Ref		Ref	
1-2 stressors	1.57	0.95 - 2.59	0.91	0.45 - 1.84	1.19	0.65 - 2.19
3-5 stressors	1.40	0.75 - 2.60	1.80	0.86 - 3.78	**2.36** **	1.22 - 4.56
6 or more stressors	1.58	0.62 - 4.01	1.02	0.29 - 3.63	**4.03** **	1.54 - 10.57
Physical abuse, 3 years later						
No	Ref		Ref		Ref	
Yes	0.69	0.17 - 2.81	0.37	0.06 - 2.39	2.59	0.72 - 9.38
Controlling partner, 3 years later						
No	Ref		Ref		Ref	
Yes	**3.17** *	1.07 - 9.37	3.46	0.63 - 18.93	1.51	0.38 - 5.96
Social support						
No	Ref		Ref		Ref	
Yes	**1.81** *	1.09 - 2.99	**2.03** **	1.15 - 3.57	**1.70** *	1.04 - 2.78
Medicaid beneficiary						
No	Ref		Ref		Ref	
Yes	0.84	0.44 - 1.61	0.95	0.45 - 2.01	0.83	0.48 - 1.45
WIC recipient						
No	Ref		Ref		Ref	
Yes	0.85	0.48 - 1.49	0.87	0.43 - 1.74	0.94	0.52 - 1.70
Home visitor services						
No	Ref		Ref		Ref	
Yes	1.24	0.74 - 2.10	1.32	0.61 - 2.88	0.74	0.40 - 1.40

** p < .05; ** p < .01; *** p < .001*

4.4 What policy and systems changes would connect women to mental health services and supports in Alaska?

Policy implies collective action by government, healthcare systems, social services, and community organizations undertaken with intentionality, to alter or build from the parenting strengths and adaptations exercised by diverse cultural communities (Cabrera, 2013). Any approach to addressing maternal depression would need to include screening and identifying women at risk of developing depression. As the results of the quantitative analysis has shown, having depression prior to pregnancy is the most important predictor of SMD. In addition, it is an important and strong predictor of persistent SMD; women with a history of depression before pregnancy are more likely to suffer from depression long after the birth of their child.

Universal depression screening of all pregnant and postpartum women is now recommended by multiple societies including the Unites States Preventive Task Force (USPSTF), The Council on Patient Safety in Women's Health Care, The American College of Obstetricians and Gynecologists (ACOG), The Agency for Research Health and Quality (ARHQ) The American Psychiatric Association (APA) and the Health Resources and Services Administration (HRSA). In October 2017, the American Medical Association adopted a new policy calling for more routine depression and anxiety screenings in new and expectant moms. Specifically, a resolution was adopted to implement screening during prenatal, postnatal, pediatric or emergency room visits. In addition, efforts are underway to make screening all perinatal patients for depression a HEDIS requirement to measure performance and quality of health care.

Though screening is the first step, prenatal care providers feel ill-equipped to

screen or discuss maternal depression and intervene appropriately. Even mental health care providers themselves often feel inadequately prepared to treat pregnant and postpartum women. Standard screening and referral processes are lacking in most health care organizations, at least in part because there is a perceived lack of high-quality, affordable, and/or accessible services to which to refer. However, maternal depression is identifiable, diagnosable, and treatable, and with more systematized training and technical assistance programs in place, capacity could be greatly increased.

There are also barriers to treating maternal depression. Stigma is one of the biggest barriers to people seeking treatment for depression and other mood disorders. Particularly in Alaska, there is ongoing stigma around mental health as mental illness was considered an actual crime up until 1959. People with any sort of mental disability who were unable to care for themselves or who could not be cared for by a family member or guardian were charged and convicted as "an insane person at large." Women continue to feel ashamed, guilty, and confused when struggling with symptoms of maternal depression, especially when they are led to believe that having a baby should be one of the happiest moments in their lives.

Systems issues include historically separate care pathways for physical and mental illness to address maternal depression clinically, as well as a dearth of trained OB/GYNs, pediatricians and primary care providers who have the opportunity to interact with women at frequent intervals during prenatal and well-child visits. Separate funding streams, billing systems, and electronic medical records make collaboration between physical and mental care providers challenging. With the Affordable Care Act's focus on integrating physical and mental health care, we may see fragmented systems begin to

coordinate and integrate to provide quality care.

In the next sections, I review federal legislation and state legislative activity, examine Medicaid specifically, and describe Minnesota's policies as examples that Alaska may consider adapting.

4.4.1 Federal Legislation Regarding Maternal Depression

In 2000, the U.S. Surgeon General's Report on Mental Health spurred media attention on postpartum depression and postpartum psychosis. Federal support for screening and treating maternal depression also rose during this time with Congress earmarking funding for the Health Resources and Services Administration's Maternal and Child Health Bureau (MCHB) to address maternal depression in 2004. The first federal legislation addressing maternal mental health was introduced in 2003, after a tragic focusing event in which a mother committed suicide. The Melanie Blocker Stokes Postpartum Depression Research and Care Act of 2003 has been revised, renamed, and incorporated into the ACA. The *Support, Education, and Research for Postpartum Depression* section of the ACA specifically promotes maternal mental health research, provides grants to support clinical services to women who suffer from or at risk of developing maternal mental health problems, and provides research funds to evaluate screening efforts. The ACA mandates mental health care parity, as well as "essential benefits" of mental health care, but health and social services providers need concrete resources to ensure women access behavioral health services in a timely fashion.

In addition, ACA includes five main provisions and regulations that are relevant to addressing maternal depression. First, the ACA supports states by providing financial incentives to expand Medicaid coverage for low-income adults up to 138 percent of the

federal poverty level. To date, 39 states, including Alaska, have expanded Medicaid (KFF, 2020). Second, the ACA requires strengthening the mental health benefit package for Medicaid-eligible adults. All plans, including Medicaid, must cover behavioral health treatment, mental health inpatient services, and substance abuse treatment (U.S. Centers for Medicare & Medicaid Services, 2020). In addition, CMS has published rules for mental and behavioral health parity in Medicaid, which should increase access to mental health care. Third, under Section 2713 of the ACA, all insurers must cover, at no cost to the beneficiary, preventive services that are identified by the U.S. Preventative Services Task Force (USPSTF), as well as by the Advisory Committee on Immunization Practices, the Health Resources and Services Administration's (HRSA's) Bright Futures Project, and HRSA and the Institute of Medicine (IOM) committee on women's clinical preventive services (KFF, 2015). State Medicaid programs that choose to cover all the most highly recommended preventive services with no cost-sharing to beneficiaries are eligible for a federal incentive payment. As previously mentioned, the USPSTF has identified depression screening in pregnant and postpartum women as a high-priority preventive service. Fourth, the ACA mentions the integration of primary and behavioral care into one collaborative care model, which would support primary care and mental health care providers in coordinating care for mothers. Lastly, many states provide health care to children and families on Medicaid through Managed Care Organizations (MCOs), which contract with the state to provide a package of care, rather than through a typical fee-for-service Medicaid model where the state directly reimburses individual providers for services provided. The state's contracts with the MCOs include an emphasis on quality and accountability standards and can focus attention on issues of particular

interest, which could potentially include maternal depression.

The *Bringing Postpartum Out of the Shadows Act* was passed in November 2017 as part of the H.R. 34, the 21st Century Cures Act and funds grants to states for innovative solutions, like psychiatry access. The law specifically states, "The Secretary shall make grants to States to establish, improve, or maintain programs for screening, assessment, and treatment services, including culturally and linguistically appropriate services, as appropriate, for women who are pregnant, or who have given birth within the preceding 12 months, for maternal depression."

Most recently, in December 2019, the federal budget bill signed to avert a government shut-down funded a Maternal Mental Health Interagency Task Force. This national task force is tasked with detailing how various federal agencies (Office of Women's Health, Surgeon General, MCHB, and Substance Abuse and Mental Health Services Administration) will address maternal mental health.

4.4.2 State Legislative Activity Related to Maternal Depression

In 1996, Vermont became the first state to pass any legislation related to maternal mental health. Vermont's *1996 Act to Coordinate the Oversight and Regulation of Health Care and Health Systems* created a task force to address public concern over the practice of hospitals discharging woman within 24 hours after birth (Nguyen & Duderstadt, 2018). This led a state mandate in 1997 requiring hospitals assess women for psychosocial and emotional concerns prior to discharge. Almost a decade later, in 2006, New Jersey became the first state to require mandatory screening for postpartum depression. The former first lady of New Jersey, Mary Jo Codey, who had suffered from postpartum depression, strongly advocated for this legislation (Rhodes & Segre, 2013). All hospitals

in New Jersey with a labor and delivery unit must now screen obstetric patients for postpartum depression prior to discharge. In addition, the New Jersey Department of Health and Senior Services is tasked with providing education and support to the hospital staff responsible for conducting the screenings. The state also operates a Family Helpline that fields questions about postpartum depression and maintains a website with educational materials as part of their public awareness campaign, "Speak Up When You're Down" (National Institute for Health Care Management, 2010). Following suit, in 2007, Illinois passed a law requiring that licensed health care professionals provide education about perinatal mental health disorders; the *Perinatal Mental Health Disorders Prevention and Treatment Act* (2008) further requires that all hospitals providing labor and delivery services offer new mothers, fathers, and other family members information about maternal mental health disorders prior to discharge following a delivery.

More recently, in 2018, California becomes the fifth state in the country (following New Jersey, Illinois, Massachusetts, and West Virginia) to require screening for perinatal mood and anxiety disorders. Although screening at least once during the perinatal period is recommended by the American College of Obstetrics and Gynecology (ACOG), it is not the standard of maternal care.

The momentum around maternal mental health legislation appears to be growing. Between 2000 and 2006, only three states passed legislation related to maternal depression; between 2007 and 2012, an additional nine states passed legislation (Rhodes & Segre, 2013). A December 2019 query for maternal mental health on the new Maternal and Child Health database maintained by the National Conference of State Legislatures revealed 39 bills enacted in 2019 in 16 states, with many specifically calling

out postpartum depression in their policies (Table 27). Some of these bills, such as establishing a postpartum depression month—have carried over from previous years.

Types of state legislation fall under: education mandates, in which a woman or family member must receive education about maternal depression; screening mandates, in which health care providers must screen for depression; public awareness campaigns to be delivered to the general population to increase understanding of risk factors and effects of postpartum depression; and task force mandates, in which a state-level task force or study group is to investigate and report on aspects of maternal mental health (Rowan, Duckett, & Wang, 2015). State health agencies are often named as a key stakeholder in legislation because they have the unique opportunity to convene maternal mortality review committees (multi-disciplinary committees that convene at the state or local level to intensive reviews of individual incidents), establish guidelines and enforce policies related to screening and treatment for pregnant and postpartum women, and increase awareness of screening and treatment options among providers, women, and their families.

Some states focus on both public and private insurance to ensure access to care for pregnant and postpartum women with a mental health condition. States mandated insurance companies cover certain mental health services for pregnant women, changed the insurance code to include pregnant women with mental health conditions in general definitions for mental health disorders and added mental health services for pregnant and postpartum women to public coverage programs (Skinner, 2020). States are working to increase access and coverage for treatment related to behavioral health overall, and in some states, this includes treatment for women during pregnancy and in the postpartum

period.

States are also proposing plans to extend medical coverage after pregnancy. For example, Missouri enacted legislation in 2018 to apply for a Medicaid 1115 demonstration waiver from the Centers for Medicare & Medicaid Services (CMS) to cover behavioral health services for women up to one year postpartum (State of Missouri Department of Social Services, 2019). Without this waiver, women not otherwise covered by insurance would lose access to behavioral health services 60 days postpartum. Missouri successfully leveraged funding available for substance use (i.e., opioid) to create more comprehensive coverage for women.

Along with ensuring coverage of maternal depression treatment, states continue to make efforts to increase access to treatment. Massachusetts created the Massachusetts Child Psychiatry Access Program (MCPAP) to address shortages of child psychiatrists in the state. MCPAP offers a phone number that a child's primary care provider can call to connect with a behavioral health professional who can provide information and referrals for the patient. The MCPAP model appears to be a feasible, scalable, and sustainable approach to increasing access to maternal mental health services (Byatt et al., 2016). More than 30 other states have created programs based on the MCPAPs model (Nguyen & Duderstadt, 2018). In recent years, MCPAP expanded to include consultations for maternal depression and postpartum depression.

Table 27. Recently enacted legislation related to maternal mental health, 2019 (compiled from the National Conference of State Legislatures)

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
California	CA ACR 92, Maternal Mental Health Awareness Month	Public awareness campaign	Dedicates the month of May 2019 as Maternal Mental Health Awareness Month	06/25/2019 – Enacted 05/07/2019 – Introduced	Waldron (Republican) Additional Authors: 63 Democrats 20 Republicans
California	CA S 104, MediCal Eligibility	Access to care	Extends Medicaid eligibility to individuals who are receiving health care coverage under MediCal and has been diagnosed with a maternal mental health condition, for a period of one year following the last day of the individual's pregnancy if the individual complies with certain requirements	07/09/2019 – Enacted 01/10/2019 – Introduced	Budget and Fiscal Review Committee
California	CA A 577, Health Care Coverage: Maternal Mental Health	Treatment of condition	Requires an individual who has been diagnosed with a maternal mental health condition to complete those covered services for that condition, not exceeding a certain number of months.	10/12/2019 – Enacted 02/14/2019 – Introduced	Eggman (Democrat) Additional authors: 2 Democrats 1 Republican
California	CA A 845, Continuing Education: Physicians and Surgeons	Education – healthcare providers	Requires the Medical Board, in determining the continuing education requirements for physicians and surgeons, to consider including a course in maternal mental health. Requires the board to periodically update any	09/04/2019 – Enacted 02/20/2019 – Introduced	Maienschein (Democrat)

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
			curricula developed pursuant to the bill to account for new research.		
California	CA A 991, Maintenance of The Codes		Raises awareness of the risk factors, signs, symptoms, and treatment options for maternal mental health conditions among pregnant women and their families, the general public, and health care providers	10/03/2019 – Enacted 02/21/2019 – Introduced *An act to make non-substantive changes and amend various Sections of the Business and Professions Code, Corporations Code, Education Code, Family Code, among others.*	Gallagher (Republican)
California	CA ACR 180, Maternal Mental Health Awareness Month	Public awareness campaign	Dedicates the month of May 2018 as Maternal Mental Health Awareness Month	06/01/2018 – Enacted 02/20/2018 – Introduced	Waldron ((Republican) Additional Authors: 12 Democrats 9 Republicans
California	CA A 1893, Maternal Mental Health: Federal Funding	Funding	Requires the Department of Public Health to investigate and apply for federal funding opportunities regarding maternal mental health. Requires the department to notify the Legislature on the department's efforts to secure and utilize the federal funding it receives.	07/20/2018 – Enacted 01/18/2018 – Introduced	Maienschein (Democrat) Additional Authors: 2 Democrats 6 Republicans
California	CA A 2193, Maternal Mental Health	Screening	Requires a licensed health care practitioner who provides prenatal or postpartum care for a patient to offer to screen, or to appropriately screen, a mother for maternal mental health	09/26/2018 – Enacted 02/12/2018 – Introduced	Maienschein (Democrat) Additional Authors 2 Democrats 2 Republicans

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
			conditions. Requires health care service plans and health insurers to develop, consistent with sound clinical principles and processes, a maternal mental health program by a specified date.		
California	CA A 3032, Maternal Mental Health Conditions	Education – healthcare providers	Requires a general acute care hospital or special hospital that has a perinatal unit to develop and implement a program relating to maternal mental health conditions including, but not limited to, postpartum depression. Requires the program to include, among other things, education and information about maternal mental health conditions for women, families, and hospital perinatal unit employees.	09/26/2018 – Enacted 02/16/2018 – Introduced	Frazier (Democrat)
Colorado	CO H 1269, Mental Health Coverage Parity	Education – healthcare providers	Authorizes more providers to provide perinatal maternal counseling for at risk persons.	05/30/2019 – Enacted 03/25/2019 – Introduced	Cutter (Democrat) Additional Authors: 3 Democrats 1 Republican
Connecticut	CT S 13, Fair Treatment of Incarcerated Persons	Access to care	Establishes prenatal, labor, and postpartum services and supports for women incarcerated at the York Correctional Institution, including access to treatment for postpartum depression by a qualified mental health professional.	05/14/2018 – Enacted 02/08/2018 – Introduced	Looney (Democrat) Additional Authors: 8 Democrats

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
District of Columbia	DC B 172, Maternal Mental Health Task Force	Task Force	Establishes a Maternal Mental Health Task Force to study maternal mental healthcare needs in the District, requires the task force to submit a report to the Mayor and the Council setting forth its findings and recommendations	07/17/2018 – Enacted 03/07/2017 – Introduced	Todd (Democrat) 6 Democrats 2 Independents
Florida	FL H 937, Perinatal Mental Health	Education - public	Requires the department of health to offer information and a hotline providing basic information on postpartum depression	03/27/2018 - Enacted 12/07/2017 – Introduced	
Georgia	GA HR 707, Maternal Mental Health Day	Public awareness campaign	Recognizes May 1, 2019 as Maternal Mental Health Day at the state capitol.	03/26/2019 – Enacted 03/26/2019 – Introduced	Dempsey (Republican) Additional Authors: 2 Republicans
Illinois	IL H 5, Substance Use and Mental Health Services Access	Access to care	Requires the Department of Human Services to ensure access to substance use and mental health services statewide for pregnant and postpartum women.	08/23/2019 – Enacted 01/09/2019 – Introduced	Flowers (Democrat) Additional authors: 13 Democrats
Illinois	IL S 1627, Code of Criminal Procedure			08/16/2019 - Enacted 02/15/2019 – Introduced	Hutchinson (Democrat) Additional authors: 8 Democrats
Illinois		Access to care	Requires health insurer to develop a maternal mental health program designed to promote quality and cost-effective outcomes. Provides that licensed physicians, advanced practice registered nurses, and physician's		

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
			assistants who provide prenatal and postpartum care for a patient shall ensure that the mother is offered screening or is appropriately screened for mental health conditions.		
Indiana	IN SR 31, Healthy Indiana Plan Impact of Pregnant Women	• Access to care • Research	Urges the Indiana General Assembly to study the impact of transferring services for pregnant women from the state's various Medicaid plans—from Hoosier Healthwise to the Healthy Indiana Maternity Care program—to ensure the same level of care for mental health and drug addiction.	03/06/2018 – Adopted 02/20/2018 – Introduced	Breaux (Democrat)
Minnesota	MN S 12, Health and Human Services	Public awareness campaign	Authorizes May as Maternal Mental Health month	05/30/2019 – Enacted 05/24/2019 – Introduced	Benson Mic (Republican)
Missouri	MO H 2280, HealthNet	Access to care	States that pregnant women receiving substance abuse treatment within 60 days of giving birth shall be eligible for Medicaid benefits for substance abuse treatment and mental health services 12 additional months, as long as the woman remains adherent with treatment.	06/01/2018 – Enacted 01/25/2018 - Introduced	Haefner (Republican)
New York	NY S 4000, Maternal Depression Treatment	Access to care; Education – public	Requires the Commissioner of Health to compile a list of providers who treat or provide support for maternal depression, requires the list of	12/18/2017 - Enacted 02/01/2017 – Introduced	Krueger (Democrat) Additional authors: 4 Democrats

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
			providers to be made available to the public on the Department's website and searchable by zip code, requires adequate investment in treatment resources for maternal depression.		
New York	NY A 8953, Maternal Depression Treatment	Education – public	Requires the Commissioner of Health to provide information on the department's and office of mental health's websites regarding how to locate available providers who treat or provide support for maternal depression	06/01/2018 – Enacted 01/09/2018 – Introduced	Richardson (Democrat) Additional authors: 1 Democrat
Pennsylvania	PA SR 108, Postpartum Depression Awareness Month	Public awareness campaign	Recognizes May 2019 as Postpartum Depression Awareness Month	05/06/2019 – Enacted 05/06/2019 – Introduced	Bartolotta (Republican) Additional authors: 9 Democrats 10 Republicans
Pennsylvania	PA HR 306, Postpartum Depression Awareness Month	Public awareness campaign	Recognizes May 2019 as Postpartum Depression Awareness Month	05/15/2019 – Enacted 05/02/2019 – Introduced	Toohil (Republican) Additional authors: 22 Democrats 15 Republicans
Pennsylvania	PA HR 183, Postpartum Depression Awareness Month	Public awareness campaign	Recognizes May 2017 as Postpartum Depression Awareness Month	04/04/2017 – Enacted 03/22/2017 – Introduced	Neuman (Democrat)
Pennsylvania	PA SR 347, Postpartum Depression Awareness Month	Public awareness campaign	Recognizes May 2018 as Postpartum Depression Awareness Month	04/25/2018 - Enacted 04/25/2018 – Introduced	Bartolotta (Republican)

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
Rhode Island	RI S 328, Mental Health Services Quality	Education – healthcare providers	Requests the Executive Offices of Health and Human Services disseminate guidelines on best practices for clinicians who care for pregnant women to screen for maternal depression during and after pregnancy.	04/27/2017 – Enacted 02/16/2017 – Introduced	Sheehan (Democrat) Additional authors: 4 Democrats
Texas	TX H 253, Postpartum Depression	• Education – healthcare providers • Education – public • Access to care • Treatment	The Health and Human Services Commission shall develop and implement a five-year strategic plan to improve access to postpartum depression screening, referral, treatment, and support services	06/14/2019 – Enacted 01/08/2019 - Introduced	Farrar (Democrat) Additional authors: 7 Democrats
Texas	TX H 650, Female Inmates	Education – correctional officers in criminal justice system	The state Department of Criminal Justice shall provide training related to medical and mental health care issues of pregnant inmates and children.	05/23/2019 – Enacted 01/08/2019 – Introduced	White (Republican) Additional authors: 8 Democrats 1 Republican
Texas	TX S 750, Maternal and Newborn Health Care	Access to care	Requires the Health and Human Services Commission to develop or enhance statewide initiatives to improve the quality of maternal health care services and outcomes for women in Texas; evaluate postpartum care services provided to women enrolled in the Healthy Texas Women program; and to develop and implement a postpartum depression treatment network for women enrolled in Medicaid	06/10/2019 – Enacted 02/11/2019 – Introduced	Kolkhorst (Republican) Additional authors: 1 Democrat

State	Statue and Title	Type of Mandate	Summary of Mandate	History of Legislation	Authors and Affiliation
			or in the Healthy Texas Women program.		
Utah	UT SCR 11, Awareness and Treatment of Maternal Depression/Anxiety	• Education – healthcare providers • Education – public • Access to care • Treatment	Encourages the Department of Health, local health departments, and the medical community to develop and utilize evidence-based approaches that expand provider training in perinatal and pediatric settings; screen mothers throughout pregnancy and postpartum and at well-child visits; increase public awareness; and expand maternal mental health data collection, monitoring, an devaluation; embed maternal mental health into all statewide crisis response policies; and expand public and private models for prevention and care.	03/19/2018 – Enacted 02/15/2018 – Introduced	Zehnder (Republican) Chavez-Houck (Democrat)
Washington	WA H 1713, Mental Health Workgroup		Requires provider payment for maternal depression screening for mothers of children ages birth to six months.	05/05/2017 – Enacted 01/26/201 – Introduced	Senn (Democrat)
Washington	WA S 5975, Paid Family and Medical Leave	Paid family and medical leave	Paid family and medical leave benefits following birth/placement of a child or serious health condition of employee/family member	07/05/2017 – Enacted	Fain (Republican)

4.4.3 Medicaid and Maternal Depression

As of February 2020, 43 states including Washington, DC—an increase from 37 in 2018– allow, recommend, or require maternal depression screening during well-child visits covered by Medicaid (Figure 3). The CMS issued guidance in 2016 stating that "since a maternal depression screening is for the direct benefit of the child, state Medicaid agencies may allow such screenings to be claimed as a service for the child as part of the [Early and Periodic Screening, Diagnostic and Treatment, (EPSDT)] benefit." EPSDT is part of a federal Medicaid requirement that mandates coverage of a wide range of preventive and treatment services for children under 21 who are covered by Medicaid. Each state provides this coverage in slightly different ways, but most stipulate that screenings be billed under the child's Medicaid coverage when the parent is not otherwise insured. Illinois, Massachusetts, New Jersey and West Virginia went further by mandating that providers screen all women for prenatal and postpartum depression.

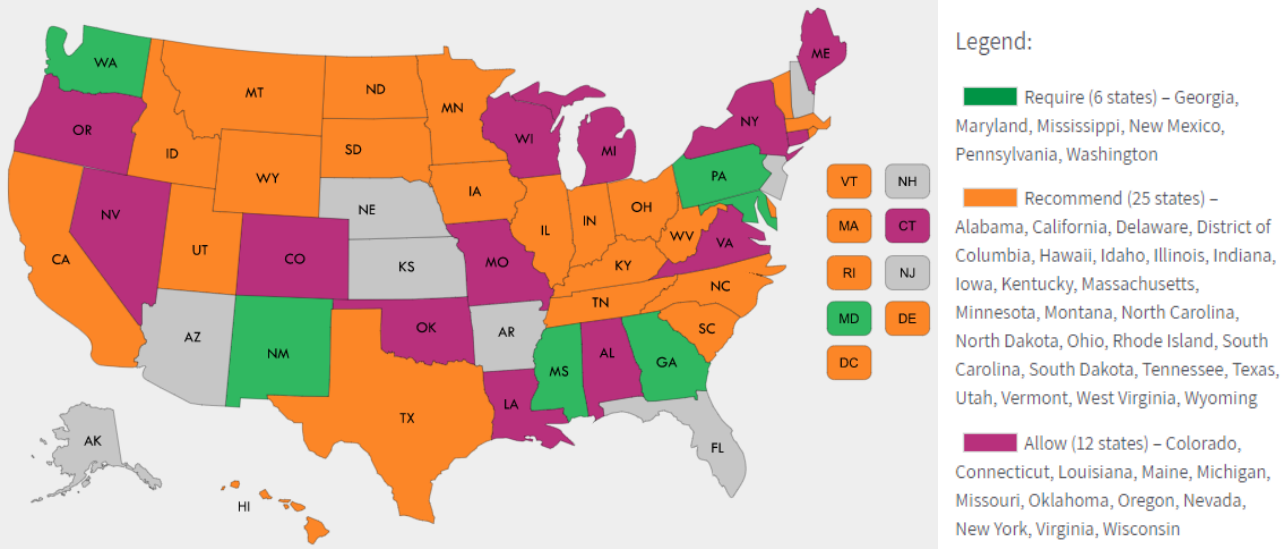
Further, following up on screening, CMS has also issued the following guidance for diagnostic and treatment services:

> *If a problem is identified as a result of an EPSDT screen, states have an obligation to arrange for medically necessary diagnostic and treatment services to address the child's needs… Mothers who are not Medicaid eligible may receive some benefit from diagnostic and treatment services directed at treating the health and well-being of the child (such as family therapy services) to reduce or treat the effects of the mother's condition on the child. Consistent with current policy regarding services provided for the "direct benefit of the child," such diagnostic and treatment services must actively involve the child, be directly related to the needs of the child and such treatment must be delivered to the child and mother together, but can be claimed as a direct service for the child.*

In addition, as demonstrated by the state of Missouri, a Medicaid 1115 demonstration waiver from the CMS would allow coverage of behavioral health services for women up to one year postpartum.

Eight states, including Alaska, do not have an active Medicaid maternal depression screening, or diagnostic and treatment policy in place. Without adequate reimbursement, it is difficult for providers to implement routine and sustainable screening.

Figure 4. State Medicaid policies for maternal depression screening during well-child visits



Source: National Academy for State Healthy Policy, https://healthychild.nashp.org/screening/maternal-depression-screening

Examples of the Medicaid coverage for maternal behavioral health include those from Colorado, Illinois, North Dakota, South Carolina, and Virginia (Institute for Medicaid Innovation, 2018):

- Colorado: Postpartum depression screening is covered as an annual depression screening. Medicaid primary care providers screen new mothers at well-child visits.
- Illinois: Mandates that providers screen all women for prenatal and postpartum

depression with an approved screening instrument. If the postpartum depression screening occurs during a well-child visit, the screening may be billed as a "risk assessment," or if the woman is postpartum and covered, the postpartum depression screening may be billed under the woman's coverage/

- North Dakota: Covers maternal depression screening as a separate service when performed during an EPSDT screening or other pediatric visit and is considered a risk assessment for the child. Up to three maternal depression screenings are allowed for a child under the age of one.
- Virginia: Covers the Behavioral Health Risks Screening Tool developed for pregnant and non-pregnant women of child-bearing age through the Maternal, Infant, and Early Childhood Home Visiting Program. Pregnant women are eligible for additional services, including case management during pregnancy and up to the end of the month following their 60th day post-partum date.

Medicaid is the largest single payer of maternity care in US, covering 43 percent of all births in 2017 (Eckert, 2020).

4.4.3 Spotlight on Minnesota's Policies Related to Maternal Mental Health

Minnesota has been identified as an early innovator and has been lauded for its legislation and innovations related to maternal mental health, and in particular, for its efforts in disseminating educational materials about perinatal mood and anxiety disorders to low-income mothers (Nguyen & Duderstadt, 2018; Rhodes & Segre, 2013). Minnesota's *Postpartum Depression and Information Legislation of 2017* mandates that hospitals, health care providers, and Women, Infants, and Children agencies provide effective education that reduces health disparities and ensures that women receive the

information (Nguyen & Duderstadt, 2018). In addition, Minnesota's Medicaid pays for depression screening under the child's coverage; covering maternal depression screening under the child's Medicaid coverage enables new mothers who may not be eligible for Medicaid to be screened. Because women are more likely to attend well-child visits than their own postpartum visits (Henderson et al., 2016), screening under a child's Medicaid coverage likely reaches more women (Nguyen & Duderstadt, 2018). Minnesota approved Medicaid billing for up to three postpartum depression screening during well-child checks in the first 12 months; after a quality improvement project funded by a grant from the Centers for Medicare and Medicaid Services, Minnesota changed the cap on the number of maternal depression screenings in well-child checks from three to six maximum billable visits in the first year of the child's life (Kartika, 2017).

To facilitate screening for maternal depression in pediatric settings, Minnesota's State Department of Health has developed and made publicly available a Clinical Guideline toolkit, which include an ideal screening workflow, documentation and charting guidance, sample scripts for clinic staff to use in screening and referral, considerations around choosing at which well-child visits to screen and which validated tool to use, as well as billing information. Minnesota also assists providers strengthen their referral practices, which may include connecting mothers to peer or community support programs (e.g., groups, hotline, other agencies), family home visiting programs, and therapy (Kartika, 2017).

Minnesota is also an example of how a state is starting to increase coordination across service systems and agencies. This coordination is needed to ensure that mothers and families get connected to the services they need and ensure that mothers are not lost

between screening and treatment. A Minnesota initiative proposed by the governor's Children's Cabinet team provides mental health consultation grants for on-site consultation to child care and early education programs, addressing mental health issues for both generations together. When there is a potential mental health issue identified, these mental health consultants offer services and referrals for needed treatment to both the children and their parents.

In addition, Minnesota had one of the more generous Medicaid benefits. New mothers were previously covered by Medicaid for a full year postpartum, though this benefit has been reduced to the minimum 60-day postpartum period established through the ACA. A goal among advocates is to extend coverage for these mothers for two years postpartum—while also extending Medicaid coverage to their child for two years.

Minnesota uses Medicaid billing data, the PRAMS survey data, and WIC and home visiting data to better understand the prevalence of depression and anxiety. State administrators determined a list of Medicaid billing codes to use in monitoring and reviewing all instances of maternal depression. States could create similar lists for their own analyses, which could inform decision making on issues like screening, treatment availability, and reimbursements.

4.4.4 Policy Options to Address Maternal Depression in Alaska

Building on the data about prevalence and risk factors for maternal depression, federal legislation, and the experience from other states, policymakers and state health and social services organizations in Alaska can play a key role in ensuring adequate support and coordination between agencies responsible for identifying and addressing maternal depression. Alaska is in a unique position with a dedicated state corporation

focusing on mental health, the Alaska Mental Health Trust Authority (Trust). The Trust has more than $536 million in cash assets, one million acres of land, a portfolio of properties in four states, all of which it uses to generate revenue to support mental health services, fund system change, award capacity building demonstration projects, create and maintain partnerships, and provide technical assistance (Alaska Mental Health Trust Authority, 2020). The Trust was established as a perpetual trust and operates like a private foundation, using its resources to ensure that Alaska has a comprehensive integrated mental health program to serve Alaskans. On average, the Trust grants more than $20 million a year across the state for community-based projects and statewide initiatives. The Trust, along with its partners in state departments (e.g., Alaska Department of Health and Social Services), local and tribal governments, governor-appointed advisory boards, and local non-profit organizations, is a key stakeholder and catalyst for change.

In July 2019, the Alaska Department of Health and Social Services, in partnership with the Trust, released the report, *Strengthening the System: Alaska's Comprehensive Integrated Mental Health Program Plan.* This plan is a response to a statutory requirement, Alaska Statute 47.30.660, which requires DHSS, in conjunction with the Trust, to develop and revise a plan for Alaska's Comprehensive Integrated Mental Health Program. Under the statute, the plan was developed by federal, state, regional, tribal, local, and private entities involved in mental health services. The plan defines nine goals, each with corresponding objectives and strategies, to create a comprehensive health care system that provides prevention, treatment and support services in Alaska. Under the second goal of healthcare, the plan includes the following select objectives: support an

increase in the number of healthcare access points to expand the availability of services to underserved, disadvantaged, geographically isolated, and special needs populations; maintain funding for Medicaid services; support ongoing Medicaid waiver and demonstration projects, and ensure quality; ensure quality, comprehensive maternal health services are robust and readily available; and increase screenings and early interventions across the healthcare system. Under the third goal of economic and social well-being are objectives to support employment, housing, and community-based social supports, all of which would increase social support and alleviate stressful life events. Though the plan does not specifically mention maternal depression, it describes approaches that align with the strategies needed to address maternal depression. This is an opportunity to include maternal depression as part of the larger effort in the state to strengthen a comprehensive and integrated mental health system.

Using the quantitative and qualitative results from this study, I design a menu of policy options that address the context and mechanism of maternal depression. I further crosswalk these policy options with the goals and objectives set forth in Alaska's comprehensive integrated mental health program to show how these strategies play an integral role in strengthening the system for Alaskan mothers, children, and families. The policy options presented in Table 28 are meant to help move this agenda forward.

Table 28. Menu of policy options to address maternal depression, aligned to objectives from Alaska's Comprehensive Integrated Mental Health Program Plan

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
1.1 Promote practice-informed, universal screening efforts and early intervention services. 1.2 Provide ongoing support to ensure accurate identification and treatment of social-emotional needs for children and their caregivers, congruent with their cultural identification. 7.1 Promote universal screening and standardized assessment and reassessment tools to reduce duplication and increase efficiencies across the service spectrum	• Fund and request that the current Alaska Perinatal Quality Collaborative study (1) mandatory universal screenings for maternal depression; (2) the timepoints for depression screening, including up to 2 years after a child is born; (3) the feasibility and desirability of formalizing screenings in non-health care settings, such as home visiting programs, WIC, addictions and mental health, community social services, and early childhood programs, (4) the selection of a mandatory screening tool, such as the Edinburgh Postnatal Depression Screen (EPDS) or Patient Health Questionnaire (PHQ-9) for screening. • Standardize screening for anxiety and depression in routine clinical practice, particularly as part of a preventive health care visit, to identify adolescent and adult women with anxiety and depression and initiate diagnostic evaluations and treatment.	• Oregon's HB 2666 created a work group on Maternal Mental Health disorders to develop recommendations for effective and accessible strategies to improve maternal mental health. • Illinois contracts with its managed care organizations and its primary care case management network to require prenatal and postpartum depression screening using an approved validated, standardized tool, referral, and treatment, as well as ongoing monitoring and tracking for enrollees. • New York City has mandated universal maternal depression screenings prenatally and at postpartum at public hospitals	Results from this analysis of Alaska PRAMS and CUBS data show that depression before pregnancy was a significant predictor of maternal depression. This underscores the importance of identifying women with depression early. Screening women for depression across the lifespan—and in particular, before or during pregnancy—can help identify women who may need targeted services after birth.

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
2.1. Alaskans have access to and receive quality healthcare services.	• Expand Medicaid coverage from 60 days postpartum at least 1 year postpartum • Require health insurers and Alaska Medicaid to cover screening, referral, and treatment provided by an obstetrician, gynecologist, pediatrician, certified midwife, or physician's assistant. Screening should be preventive at billed at no cost to the patient.	• 31 states and the District of Columbia have adopted Medicaid expansion programs that extend coverage for new mothers beyond 60 days; Alaska is not one of these states. • Michigan's fiscal year 2021 budget proposal includes a "Healthy Moms, Healthy Babies" section, which will extend Medicaid coverage to moms for a full year after birth and require postpartum checks for depression and anxiety • Minnesota's HF 3892 bill extends Medicaid to mothers from 60 days to one year • New York State legislation requires health insurers to cover maternal depression screening, referral and treatment performed by an obstetrician, gynecologist, or pediatrician.	Depression is a chronic condition. About 20% of women in Alaska who gave birth between 2012-2014 reported symptoms of maternal depression, and 7.2% report symptoms of depression up to 3 years after birth. Medicaid plays a large role in maternity coverage, and a postpartum extension would allow mothers to maintain continuity of care in the year following delivery, access critical health services if needed, and potentially transition to other sources of coverage on a more flexible timeline. While some women may receive screening for maternal depression through their child's Medicaid plan, they often are not able to get treatment without coverage
2.2. Ensure quality comprehensive maternal health services are robust and readily available.	• Increase efforts to integrate behavioral health with primary care through financial incentives for primary care providers • Require health insurers to cover mental health benefits, such as therapy, counseling, and mental	• New York state's Office of Mental Health is building incentive structures to encourage primary care providers to adopt the Collaborative Care Model, which integrates behavioral health services into the primary care setting	Telehealth is one strategy to logistical barriers (e.g., transportation, childcare) to care. In Alaska, the use of telehealth for behavioral services and counseling may expand the availability of services to underserved, disadvantaged,

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
	and behavioral inpatient services, as essential services • Include telehealth behavioral health services-- consultation, medication management, individual and group psychotherapy, support groups, and targeted parent webinars—as a reimbursable encounter. • Expand existing telemedicine initiatives to increase access to and mental health professionals. • Establish a statewide perinatal mental health referral network and an online compendium of sources of care to be updated at least annually. • Establish a maternal mental health helpline and contract with local behavioral health agencies to have telephone counselors provide information and referrals for health screening and treatment.	• The 2010 Massachusetts Postpartum Depression legislation created the Massachusetts Child Psychiatry Access Program (MCPAP), a system of behavioral health consultation teams designed to help primary care providers manage the behavioral health of their patients. • Under its Postpartum Coverage Expansion Act Amendment of 2020, Washington D.C. is seeking approval from CMS that Medicaid health policies cover "innovative models of care," including telehealth visits, remote patient monitoring and mobile health interventions, such as telemental health services that provide on-demand access to care for depression and stress. • California introduced AB 2193 requesting telepsychiatry consultation for mothers and children • New Jersey's Postpartum Depression Law set aside $4.5 million to establish a statewide perinatal mental health referral network.	geographically isolated communities.
5.2 Support and improve the system to assist individuals in crisis. Support multi-disciplinary	• Supplement federal program funding of the Maternal Infant Early Childhood Home Visiting (MIECHV) program to expand access to and	• California proposed a $30 million investment in home visiting in 2020.	Home visiting programs are one evidence-based strategy to support moms. They provide social support, which

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
teams to provide the needed level of service.	availability of prenatal and early childhood home visitation services. Home visiting may include a team of nurse, social worker, and behavioral health consultant. Further, home visiting programs can be used as a tool to screen and make referrals to qualified professionals. • Include mental health consultants as a key member in home visiting programs to help strengthen the capacity to respond to families with depression and other risks. The consultant can directly work with the family alongside the home visitor to address mental health. • Establish automated referral paths to connect families with services to better address housing, employment, food security, and safety	• The Louisiana Nurse-Family Partnership program has augmented their standard nurse intervention with mental health professionals to address maternal mental health, including maternal depression.	can help decrease maternal depression, and have strong connections to community resources. Home visitors can also help deliver coaching, education, food and housing assistance, and mental health services. Social support is critical to promote good experiences in pregnancy, childbirth, and the postpartum period, which can prevent the development of new mental illness in the maternal period and mitigate exacerbation of existing mental illness.
9.2 Advance the competencies of the healthcare, behavioral health, and public health workforce	• Require primary healthcare, behavioral health, early childhood providers, and public health workforce attend the Strengthening Families™ Alaska modules offered through the Child Welfare Academy at the University of Alaska in partnership with Alaska's Office of Children's Services. Strengthening	• Minnesota's Postpartum Depression Education & Information Bill (S.F. 2278) requires all providers of prenatal care to have information about postpartum depression available to pregnant women and their families, and that hospitals and other health care facilities must	To increase knowledge regarding the treatment of mothers during pregnancy and postpartum, make clinicians more comfortable working with this population, and improve the treatment these women receive so that

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
	Families is a research-informed strategy to increase family strengths, promote parental resilience and help build social connections. (Can be used for continuing medical education or continuing education credits.) • Require primary care providers to complete training on the use of the identified anxiety and depression screening tools and response protocol • Encourage state medical board to partner with local Postpartum Support chapter to create trainings for physicians, mid-level providers, and community health aides	provide new mothers and their families with written information about postpartum depression. • California AB 845 encourages state medical board to create trainings for physicians	it reaches current standards of care.
n/a	Support and develop a public awareness campaign that educates the general public—and especially Asian/Pacific Islanders, those of Hispanic descent, and Alaskan Natives—about family mental health and its impact on children. Messages should be culturally appropriate and support a preventive approach. Create resources, opportunities, and training for healthcare providers and caregivers, including grandparents and other extended family members.	Many states currently have a postpartum depression awareness day or month, typically in May. Utah, Michigan, Texas, New Jersey and Washington State have statewide public awareness campaigns. One example is "Speak Up When You're Down" with hotlines and website providing information and hotlines for those concerned about maternal depression.	Normalizing the need for mental health services reduces stigma and is necessary for identifying women with maternal depression and having women accept treatment. This is particularly important for Asian/Pacific Islanders and Alaska Native people, who, according to the PRAMS and CUBS data, are

Objective from Alaska's Comprehensive Integrated Mental Health Program Plan	Policy Option to Address Maternal Depression in Alaska	Examples from Other States/ Cities	Rationale
			most impacted by maternal depression. .
n/a	• Appoint an advisory group to track and report on the impact of policies on maternal depression rates through PRAMS and CUBS. This may be a subgroup of the Alaska Perinatal Quality Collaborative • Require health care organizations to adopt Healthcare Effectiveness Data and Information Set (HEDIS) measure for screening and treatment of maternal mental health disorders	California's ACR 148 established a Task Force on the Status of Maternal Mental Health Care, who had been tasked with reviewing state-level data collected by the state department of health .	We need to continue to collect data to encourage a culture of data-driven decision-making that includes data sharing, data analysis, and management.

CHAPTER 5: DISCUSSION

In this chapter, I summarize the key findings from my analyses, answering my three research questions. I explain how these findings fit in the current body of knowledge on maternal depression. I also consider how these findings can be used to design policy for improving the health and well-being of mothers and families in Alaska. The last sections of this chapter include a description of the strengths and limitations of this study.

5.1 Summary of Key Quantitative Findings

5.1.1 Prevalence of Symptoms of Maternal Depression in Alaska

Among women who gave birth between 2012 and 2014 in Alaska, 20% reported SMD during the immediate postpartum period. At three years postpartum, 19% reported SMD. Among women who reported postpartum SMD in 2012-2014, 36% also reported SMD three years later.

Using PRAMS data collected among mothers who gave birth in 2012, CDC reported that the overall prevalence of postpartum depressive symptoms was 12% across 27 states, ranging from 8% (Georgia) to 20% (Arkansas) (Ko et al., 2017). Alaska's period prevalence of 20% is on the higher end of the range reported by CDC, underscoring the need to prioritize efforts to prevent, identify, and treat maternal depression.

In addition to comparing our prevalence of maternal depression with other states, we can also assess how we are doing over time. The State of Alaska Maternal and Child Health Epidemiology Unit conducted its first and only analysis of SMD using PRAMS and CUBS data from a cohort of mothers who delivered in 2004 (McLaughlin et al.,

2009). The prevalence of self-reported postpartum SMD in Alaska has been stable over time and the figures for 2012-2014 are similar to the prevalence reported in 2004. In 2004, 12% of women reported resolved SMD, and in 2012-2014, 12% of women also reported resolved SMD. The number of women reporting persistent SMD in 2012-2014 decreased slightly when compared to 2004: about 10% of women reported persistent SMD in 2004, compared to 7% in 2012-2014. The one year after childbirth has typically been the focus for maternal health issues, but this research suggests that extending the timeframe to at least 3 years will help identify women who continue to suffer from depressive symptoms beyond the immediate postpartum period. Supporting this further, recent research from the National Institutes of Health (NIH) tracking close to five thousand women for three years after childbirth found that about 25 percent of the women reported moderate to high levels of depressive symptoms at some point, and that the remaining 75 percent experienced low-level depressive symptoms throughout the study (Putnick et al., 2020). The researchers at NIH suggest that screening for maternal depression beyond the postpartum period may be warranted

5.1.2 Sociodemographic, Perinatal Health, and Psychosocial Factors Associated with SMD

As described earlier, much of the literature is mixed or conflicting about the effects of predictors on maternal depression. In this study, based on bivariate analyses, nearly all the variables I analyzed were associated with SMD. Women reporting symptoms of depression in Alaska are more likely to be Asian/Pacific Islander; be younger, with more women in the 20-24 years old range; have less than a high school education; have lower household income (less than $18,000); be a Medicaid beneficiary;

be a WIC recipient; unmarried; have had depression before pregnancy; receive prenatal care later in their pregnancy; have a baby admitted to the NICU; not breastfeed; have an unintended pregnancy; experience a greater number of stressful life events (3 or more) in the 12 months before baby was born and also at 3 years after birth; experience physical abuse from a partner; and have a controlling partner who threatened and made her feel unsafe; and have no or limited social support. These associations are simply a starting point for understanding the profile of women who may be at higher risk of SMD.

This study confirms a number of previous studies' findings on positive associations between certain risk factors and maternal depression, including history of depression, stressful life events, and lack of social support. In addition to confirming the associations of these well-established risk factors, this study offers insights into three other factors as well. Analyses revealed a significant association between Asian/Pacific Islander women and SMD. Other variables significantly associated with SMD are age and parity.

History of depression. Having a history of depression is the most important predictor of SMD, which increased the odds of SMD by 254% (aOR 3.54, CI 2.1-5.95). The evidence is clear that a previous history of anxiety and depression is a risk factor in the development of maternal depression (Biaggi et al., 2016; Milgrom et al., 2019; Rich-Edwards et al., 2006; Rubertsson et al., 2014). Further, a history of depression is significantly associated with a mother reporting persistent SMD (aOR 7.43, 95% CI 3.38-16.33), indicating that these mothers' depression continues to be untreated. This highlights the need for appropriate identification of general depression as well as maternal depression, and access to treatment options.

Stressful life events. Many studies have identified stressful life events during pregnancy as a predictor of maternal depression (Beck, 2001; Robertson et al., 2004). Results from this study show that stressful life events, both in the pregnancy period and in the 3 years following the baby's birth, are significant predictors of SMD. Women experiencing 6 or more stressors during pregnancy and 6 ore more stressors in the 3 years after birth had increased odds of reporting SMD (aOR 2.39, 95% CI 1.13-5.07, aOR 2.19, 95% CI 1.08-4.44, respectively). Experiencing 6 or more stressors during pregnancy was also significantly associated with reporting persistent SMD (aOR 4.86, 95% CI 1.48-15.98). Similar to other studies, I also observe dose-response relationship, where greater number of stressors lead to higher odds of reporting SMD (Liu & Tronick, 2013; Mukherjee et al., 2017).

Social support. Social support is an important protective factor. Mothers without social support were 86% more likely to report SMD (95% 1.32, 2.61) than those with social support. These findings are consistent with past studies, which have clearly found that women with lower social support report more depression symptoms than women with higher social support (Biaggi et al., 2016; Milgrom et al., 2019). Support networks reduce isolation and loneliness, improve the ability to cope with stress and adverse life events, and provide physical and emotional comfort. There is also evidence that social support has a mitigating effect on the relationship between stress and adverse pregnancy outcomes (Beck, 2001). Further, Shrivastava, Shrivastava, & Ramasamy (2015) suggest that the presence of a healthy and supportive family and friends, especially support from a partner or husband, can override other risk factors. My findings suggest that regardless of marital status, having social support is a protective factor against SMD.

Race: Asian/Pacific Islander. Asian/Pacific Islander women have significantly higher odds of reporting SMD (aOR 2.41, 95% CI 1.31-4.44). Many studies have found that minorities, especially Black and Hispanic women, report more postpartum depressive symptoms than White women (Rich-Edwards et al., 2006), though fewer studies have examined Asian/Pacific Islander and Alaska Native women specifically. A study using the New York City 2004-2007 PRAMS data found that Asian/Pacific Islander women were 3.2 times more likely to be diagnosed with postpartum depression (95% CI 1.7-6.0) (Liu et al., 2016), confirming our findings of this mental health disparity for Asian/Pacific Islander women. A study using the Hawaii PRAMS 2004-2007 data found that women across almost all Asian and Pacific Islander groups (Korean, Chinese, Filipino, Samoan, Hawaiian, Other Pacific Islander) were twice as likely as white women to report depressive symptoms (Hayes, Ta, Hurwitz, Mitchell-Box, & Fuddy, 2010). Further, other studies have found that recent immigrants, in particular, have increased odds of experiencing maternal depression compared to non-immigrants (Eastwood, Phung, & Barnett, 2011; Lanes, Kuk, & Tamim, 2011). The added stresses of living in a new surrounding in an unfamiliar culture, may compound the pressures of new motherhood. If Asian/Pacific Islander women living in Alaska do not have extended family nearby—which, for many, is the heart of their social support—that may be another key explanation for the increased odds of SMD.

Age. Age was also a significant predictor of SMD in this study, though the literature on the association between age and maternal depression is inconclusive. Some studies have shown that age and postpartum depression have a U-shaped relationship, in that the risk of depression is higher under the age of 24, decreases between the ages of

24-35, and increases again over the age of 35 (Jerry Guintivano et al., 2018; Mirowsky & Ross, 2002). In contrast, I observe an inverted U-shaped curve here: the odds of report SMD are lowest for women 19 and under (aOR 0.51), increases for those 20–34 (aOR 0.98-1), and decreases slightly for women age 35 and older (aOR 0.80). Of note, teenage moms 19 years and under have the lowest odds of reporting SMD.

It is not entirely clear why these young moms are less likely to report SMD, but previous studies have suggested that adolescent mothers with higher levels of social support have better mental health outcomes than those with less support (Bunting & McAuley, 2004; Crnic & Low, 2002; Huang, Costeines, Kaufman, & Ayala, 2014; Logsdon, Birkimer, Ratterman, Cahill, & Cahill, 2002) and they also had lower levels of stress (Crnic & Low, 2002). I speculate that one possible explanation for teen's lower odds of SMD is that in Alaska, many teen moms live with their parents and extended family, who can provide financial, caregiving, and social support.

Another explanation may be that adolescent mothers are a priority, vulnerable subgroup eligible to receive financial assistance, parenting education, and other specialized supports—in addition to Medicaid, WIC, home visiting services, Temporary Assistance for Needy Families and rental assistance—to help navigate motherhood. These programs and services help to reduce stressors. Peer-to-peer groups, intensive case management, and other programs may help provide social and emotional support for teen mothers. For example, in Anchorage Public School district has an alternative public high school specifically designed for pregnant and parenting teens. Enhanced local community resources and services tailored to pregnant and parenting teen moms may provide them with a strong support network, which in turn, may help alleviate SMD.

Parity. Parity was a significant predictor of SMD in this study, with first-time moms having 1.45 the odds of reporting SMD. Previous studies have suggested first-time others may be at higher risk of maternal depression (Smorti et al., 2019), though as with many other risk factors, this is not definitive. First-time mothers tend to be less confident in their new role and have greater difficulty in early interactions with their babies, leading to anxiety and postpartum depression (Righetti-Veltema et al., 2002). In addition, parity is associated with incident SMD. After controlling for sociodemographic, maternal health, and psychosocial variables, the odds of first-time moms reporting incident SMD were 1.67 times the odds of those who were not first-time moms. Incident SMD is based on depressive symptoms present only during the 3-year follow-up survey, and it may be that mothers have had a second child by this time. Having a second child in addition to a toddler can be overwhelming and stressful, perhaps leading to SMD that is captured in the 3-year follow-up and classified as incident SMD in this study.

5.2 Implications for Policy Design

Findings from this study can be used to design policy and create systems change to improve the health and well-being of mothers and families. There are opportunities to systematically implement policies and programs to jointly address the prominent risk factors of SMD.

First, any strategy to addressing maternal depression would require a two-pronged screening approach: (1) screening to identify women at risk of developing depression, and (2) screening for maternal depression symptoms. History of depression is unequivocally an important predictor of maternal depression, which underscores the importance of routine screening of all adolescent and adult women for mental health

concerns. Ideally, women with depression would be identified and treated before pregnancy, but if not, it is critical that they are identified and treated during pregnancy. The USPSTF already recommends screening for depression in the general adult population, including pregnant and postpartum women (Campos-Outcalt, 2019). The Women's Preventive Services Initiative (WPSI), a national coalition of women's health professional organizations and patient representatives, recently developed a new recommendation on screening for anxiety in adolescent girls aged 13 years or older and adult women to improve detection, achieve earlier diagnosis and treatment, and improve health, function, and well-being (Gregory et al., 2020).

In addition to identifying girls and women at risk of developing depression, universal depression screening of all pregnant and postpartum women is now recommended by multiple medical associations, including the United States Preventive Task Force (USPSTF), The Council on Patient Safety in Women's Health Care, The American College of Obstetricians and Gynecologists (ACOG), The Agency for Research Health and Quality (ARHQ) The American Psychiatric Association (APA) and the Health Resources and Services Administration (HRSA). In October 2017, the American Medical Association adopted a new policy calling for more routine depression and anxiety screenings in new and expectant moms. Specifically, a resolution was adopted to implement screening during prenatal, postnatal, pediatric or emergency room visits. In addition, efforts are underway to make screening all perinatal patients for depression a HEDIS requirement to measure performance and quality of health care.

In order to implement universal screening, providers need to identify which screening instrument to use, how the screener will be administered (e.g., by a medical

assistant, self-administered), frequency of screening, how the data will be captured and stored (e.g., paper, electronic), and how the information will be used and shared with other mental health providers treatment planning. Further, providers—including physicians and nurses—need to be trained on evidence-based guidelines related to maternal depression. In 2019, the USPSTF issued a new recommendation that clinicians provide or refer pregnant and postpartum women who are at increased risk of maternal depression to counseling interventions (Curry et al., 2019). If screening is conducted in the office of an OB/GYN or pediatrician, these providers need to know how to follow up or when to refer to specialists for counseling therapy as needed.

Second, expanding Medicaid coverage from 60 days postpartum to at least 1 year postpartum, preferably 2 years, is one strategy that may help increase opportunities for healthcare providers to treat women with maternal depression. Medicaid plays a large role in maternity coverage, and a postpartum extension would allow mothers to maintain continuity of care in the year following delivery, access critical health services if needed, and potentially transition to other sources of coverage on a more flexible timeline. Depression is a chronic condition. About 20% of women in Alaska who gave birth between 2012-2014 reported symptoms of maternal depression, and 7% report symptoms of depression up to 3 years after birth. While some women may receive screening for maternal depression through their child's Medicaid plan, they often are not able to get treatment without coverage. Expansion of health coverage through Medicaid allows for additional touchpoints with the system, and additional opportunities for a woman to be screened and treated. In addition, expanded health coverage could help alleviate some of the financial stressors a mother may feel, which should reduce the risk of SMD.

Third, additional outreach efforts to enroll and retain Asian/Pacific Islander women into home visiting programs in Alaska may provide more support to this group. The MIECHV program in Alaska already targets young, first-time, low-income mothers. Adaptations to the home visiting model to ensure that it is culturally appropriate for Asian/Pacific Islander mothers may be necessary. Further, because the MIECHV model currently used in Alaska, the Nurse-Family Partnership program, begins prenatally, nurse home visitors have an opportunity to provide some level of direct prenatal care. During pregnancy and after delivery, nurse home visitors can help mothers better cope with stressful life events, refer to available community programs and resources, and provide general social support. Most women need and crave support for their mothering role, and value greatly support from others when they get it (Knitzer, Theberge, & Johnson, 2008).

Fourth, understanding what factors contribute to a mother's stress could help the mother and a practitioner identify available resources and outline interventions to decrease stress. Promotion of stress management skills, improved coping mechanisms, and access to necessary resources during pregnancy and immediately after birth may head off increased depressive symptoms associated with stress. Policy and public health efforts to identify and reduce stress among pregnant women will likely benefit the physical and mental health of mothers and children. Resiliency, defined as the ability to adapt or respond positively to stress and adversity (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008) is a familiar topic in Alaska, especially among Alaska Natives, who have faced colonization, assimilation policies, discrimination. There are numerous trainings and workshops available throughout the state about the history of resiliency among Alaska Natives and how to cultivate resiliency in today's world. Strengthening

Families™ is a research-informed, strength-based approach offered to helping families reduce stress, address risk factors, and promote healthy development. Two topics of focus in the program are parental resilience and social connections. The Strengthening Families program has been culturally adapted for Alaska and is offered through the Child Welfare Academy at the University of Alaska in partnership with Alaska's Office of Children's Services. Offering primary health, behavioral health, early childhood providers, and public health workforce the opportunity attend the Strengthening Families™ Alaska for continuing medical education or continuing education credits may help enhance skills for working with parents to develop resilience and build positive relationships.

Lastly, many states currently have a postpartum depression awareness day or month, typically in May. Utah, Michigan, Texas, New Jersey and Washington State have statewide public awareness campaigns. One example is Washington's highly publicized "Speak Up When You're Down" with hotlines and a website providing information and hotlines for those concerned about maternal depression. Alaska policymakers should support and task the Department of Health and Social Services with developing a public awareness campaign that educates the general public—and especially Asian/Pacific Islanders, those of Hispanic descent, and Alaskan Natives—about family mental health and its impact on children. Messages should be culturally appropriate and support a preventive approach. Normalizing the need for mental health services reduces stigma and is necessary for identifying women with maternal depression and having women accept treatment. This is particularly important for Asian/Pacific Islanders, who are most impacted by maternal depression.

5.1.3 Policy and Systems Changes to Connect Women to Mental Health Services

Based on the results on prevalence and risk factors for maternal depression and the environmental scan of federal legislation and the experience from other states, policymakers and state health and social services organizations in Alaska can take concrete action to address maternal depression. Considering the context of the resource and infrastructure available in Alaska, and the potential mechanisms in how interventions can help address risk factors of maternal depression, policymakers in Alaska can consider prioritizing the following:

- Standardize screening for anxiety and depression in routine clinical practice, particularly as part of a preventive health care visit, to identify adolescent and adult women with anxiety and depression and initiate diagnostic evaluations and treatment. There is evidence that screening alone can have some clinical benefits, although initiation of treatment or referral to mental health care providers offers maximum benefit. Systems should be in place to ensure follow-up for diagnosis and treatment.
- Fund and request that the current Alaska Perinatal Quality Collaborative study (1) mandatory universal screenings for maternal depression; (2) the timepoints for depression screening, including up to 2 years after a child is born; (3) the feasibility and desirability of formalizing screenings in non-health care settings, such as home visiting programs, WIC, addictions and mental health, community social services, and early childhood programs, (4) the selection of a mandatory screening tool, such as the Edinburgh Postnatal Depression Screen (EPDS) or

Patient Health Questionnaire (PHQ-9) for screening.

- Expand Medicaid coverage from 60 days postpartum at least 1 year postpartum
- Require health insurers and Alaska Medicaid to cover screening, referral, and treatment provided by an obstetrician, gynecologist, pediatrician, certified midwife, or physician's assistant. Screening should be preventive and billed at no cost to the patient.
- Supplement federal program funding of the Maternal Infant Early Childhood Home Visiting (MIECHV) program to expand access to and availability of prenatal and early childhood home visitation services. Home visiting may include a team of nurse, social worker, and behavioral health consultant. Further, home visiting programs can be used as a tool to screen and make referrals to qualified professionals.
- Require primary healthcare, behavioral health, early childhood providers, and public health workforce attend the Strengthening Families™ Alaska modules offered through the Child Welfare Academy at the University of Alaska in partnership with Alaska's Office of Children's Services. Strengthening Families is a research-informed strategy to increase family strengths, promote parental resilience and help build social connections.
- Support and develop a public awareness campaign that educates the general public—and especially Asian/Pacific Islanders, those of Hispanic descent, and Alaskan Natives—about family mental health and its impact on children. Messages should be culturally appropriate and support a preventive approach. Create resources, opportunities, and training for healthcare providers and

caregivers, including grandparents and other extended family members.

5.3 Strengths of the Study

This study used data from the 2012-2014 Alaska Pregnancy Risk Assessment Monitoring System and the follow-up 2015-2017 Childhood Understanding Behaviors Survey. The population-based nature of the PRAMS and CUBS sample and its complex survey design allowed for a weighted sample of 32,468 women. By surveying a representative sample of the state's population, the results of this study may be generalized to women across the state.

The combination of PRAMS and CUBS is also a strength because it provided a longitudinal dataset. I was able to take a longer-range perspective of maternal depression beyond the initial postpartum period to three years after birth. There are very few studies on the long-term effects of maternal depression. Many studies end around 6 months. Having this data allowed me to assess which mothers stayed depressed or got better. Conceptualizing and examining persistent symptoms of depression shows how this chronic condition can be overlooked and remain untreated in the years after childbirth. Few previous studies have used longitudinal data to examine the prevalence and risk factors for persistent maternal depression; to my knowledge, one study has used population-based data from postpartum women (Blabey et al., 2009).

The quantitative results from this study also add to the broader literature on prevalence and risk factors of maternal depression. Specifically, I provide prevalence estimates of maternal depression for Alaska Native mothers, which is not available elsewhere.

In addition, combining the quantitative data with an environmental scan of

policies related to maternal mental health, I focus concretely on variables that are likely to influence a given policy and affect its outcome. The findings of this study can provide insights for systems change and support healthcare—including behavioral health—providers and policy makers in building comprehensive programs and policies to address maternal depression in Alaska.

5.4 Limitations of the Study

The findings from this study are subject to limitations common in surveys, and some bias is expected from any survey based on self-reported information. First, PRAMS and CUBS rely on self-reported, retrospective data, and respondents may not accurately recall or report truthfully to all questions, particularly sensitive questions such as ones related to intimate partner violence. With stigma attached to mental health and risky behavior during pregnancy, such as tobacco use and alcohol use, there is social desirability biases which may lead to underreporting. In addition, some PRAMS questions ask the respondent to remember events or behaviors up to 12 months before they got pregnant, including stressful live events. Second, PRAMS data is collected through mail and phone interviews with women who do not respond by mail. Language barriers and cultural aspects may impact responses on the mental health measures; it may be that the questions asked on PRAMS and CUBS are interpreted differently by people from non-White cultures.

The models I developed do not fully explain SMD, as much of the variance remains unaccounted. There are other important variables that I have not included in the models, due to the data not being available in PRAMS and CUBS, such as genetic predisposition of mental health disorders and biological factors. I did not examine self-

esteem, childcare stress, infant temperament, which Beck (2001) has found to be significant predictors.

In addition, some of the odds ratio estimates have wide confidence intervals, suggesting uncertainty around the odds ratio estimate and lack of precision, suggesting there is variability in the data. Regardless, the models developed in this research help us better understand relationships between variables and their effect on SMD.

The environmental scan was comprehensive and based on a review grey literature and documents from existing federal guidance, state legislations, policy syntheses, presentations, reports, and data from government agencies, universities, state mental health coalitions and collaboratives, research organizations, professional health organizations, and nonprofit and philanthropic organizations. Future studies with additional qualitative data to inform policy implementation would help to strengthen our understanding of the policy options.

CHAPTER 6: CONCLUSIONS

The results from this study provide a better understanding of the prevalence of maternal depression in Alaska and a basic profile of women who experience symptoms of maternal depression during the immediate postpartum period, and at 3 years postpartum. It also offers a foundation for future research to further explore how and why specific predictors influence or don't influence maternal depression. We should seek to understand why moms age 19 and under have decreased odds of reporting SMD. Examining the type of stressful life events—financial, partner/interpersonal relationship, trauma—and its association with SMD can help us better understand how to support women and provide with them tools and resources to manage the stress. In addition, there are specific questions around Asian/Pacific Islanders to be explored: Are there subgroup differences in SMD (e.g., segment Asians and Pacific Islander; possibly examine subgroups of Chinese, Korean, Japanese. Filipino, Hawaiian)? What are the barriers to Asian/Pacific Islander mothers getting screened and treated for maternal depression? How should home visiting services be culturally adapted for Asian/Pacific Islander families? Further, if any policy or program are implemented to address maternal depression, an evaluation of the process, outcomes, and impact should be conducted. Researchers can examine to what extent implemented policies and programs (e.g., screening, expanded Medicaid, home visiting) have affected the prevalence of maternal depression and treatment.

While there are more research questions to answer in the future, this current study answers questions about the scope and nature of maternal depression in Alaska. I have identified and defined the problem for agenda setting, and I have formulated a menu of

policy options that take into the context of the issues and the possible mechanisms behind maternal depression. Further, examining what other states have adopted allows policymakers in Alaska to learn from their lessons. There is significant investment in the MIECHV program at the federal level and in Alaska. Through the Alaska Mental Health Trust, Alaska has support to further strengthen its current system. Using the infrastructure that is currently available through home visiting and the resources dedicated to mental health, as well the opportunities for Medicaid expansion and the heightened interest in maternal health and child development during the current times of the COVID-19 pandemic, there are numerous windows of opportunities for policy and systems change to address maternal depression. This research and analysis took place during the COVID-19 pandemic, which has been recognized as a mental health crisis for parents (Grose, 2020). Though many parents of young children across demographics are feeling increased levels of stress, two subgroups may be particularly at risk for clinical levels of anxiety and depression right now: women who are pregnant or recently gave birth, and parents who are struggling financially to meet their children's basic needs. Social distancing and quarantine recommendations also add to feelings of isolation and lack of social support. With the pandemic as a focusing event, current events have highlighted the mental health crisis we have in Alaska. With policy options available and key policy entrepreneurs identified, a policy window just might open.

APPENDIX A: LETTER OF EXEMPTION FROM THE GEORGIA STATE UNIVERSITY INSTITUTIONAL REVIEW BOARD

INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999
Atlanta, Georgia 30302-3999
Phone: 404/413-3500

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58 Edgewood
FWA: 00000129

Georgia State University

October 15, 2019

Principal Investigator: John Thomas

Key Personnel: Cheung, Karen; Thomas, John

Study Department: Public Management and Policy

Study Title: Maternal Mental Health: Results from the Alaska PRAMS 2012-2014 and Its Three-Year Follow-Up Survey, CUBS 2015-2017, and Implication for Public Health Programs and Policies

Submission Type: Exempt Protocol Category 2,4

IRB Number: H20205

Reference Number: 357225

Approval Date: 10/14/2019

Status Check Due By: 10/13/2022

The above referenced study has been determined by the Institutional Review Board (IRB) to be exempt from federal regulations as defined in 45 CFR 46 and has evaluated for the following:

1. Determination that it falls within one or more of the eight exempt categories allowed by the institution; and
2. Determination that the research meets the organization's ethical standards

If there is a change to your study, you should notify the IRB through an Amendment Application before the change is implemented. The IRB will determine whether you research protocol continues to qualify for exemption or if a new submission of an expedited or full board application is required.

A Status Check must be submitted three years from the approval date indicated above. When the study is complete, a Study Closure Form must be submitted to the IRB.

Any unanticipated/adverse events or problems resulting from this investigation must be reported

immediately to the University Institutional Review Board. For more information, please visit our website at www.gsu.edu/irb.

Sincerely,

Kiki Sindad, IRB Member

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